in 1898

THE MICROSCOPE.

AN ILLUSTRATED MONTHLY.

Volume 5,

FOR

1897.

Founded 1881, by C. H. Stowell. Published since 1892, by
Chas. W. Smiley, Washington, D. C., U. S. A.

THE MICROSCOPE

JANUARY, 1897.

NUMBER 49 NEW SERIES

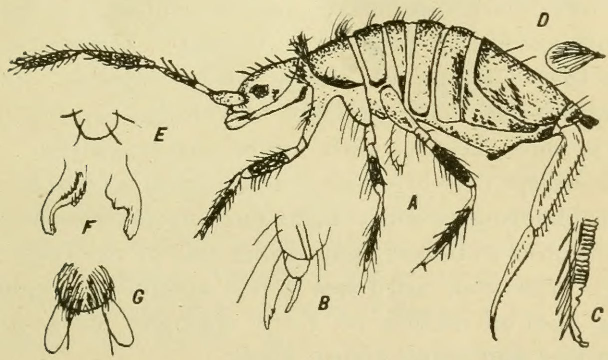
House-Infesting Spring-Tail.

Lepidocyrtus americanus, n. sp.

BY C. L. MARLATT.

WASHINGTON, D. C.

In the course of a comprehensive study of insects frequenting dwellings, attention was drawn to a little Collembolan, found in Washington which may often be seen on window-sills where there are window plants, or in bath-



HOUSE-INFESTING SPRING-TAIL.

a Lateral view of female; *b* foot; *c* tip of spring; *d* scale; *e* labrum *f* mandibles; *g* maxillæ and labium.

rooms, or whereever moist conditions prevail. This species is a very handsome one, and seems, from reference to the authorities, to be hitherto undescribed. The following is a characterization of the species *Lepidocyrtus americanus, n. sp.* Length, 1.5 mm; with spring unfolded above 2 mm; head bent strongly downward, as

in *L. curvicollis*, Luddock; antennæ 4-jointed, more than one-half length of body; basal joint not much more than one half length of others, which are sub-equal; abdomen with four segments, the third of which equals one-third length of body; legs tapering, with minute terminal tarsal joint; armed at apex with large spur, notched at tip and below, which is a strong simple spur or spine, spring more than half the length of body, jointed at center, the apical portion bifurcated, densely clothed with long fine hairs, terminal rays very finely and regularly comb-notched on lower or posterior edge and somewhat curved downward at tip, with three or four short, rather distinct, teeth at extreme tip; catch a strong groove or sheath extending one-third length of center of abdomen and grasping spring strongly up the middle joint.

The body is clothed with flat striate scales, and dorsally with scattering heavy, almost clubbed, hairs; the anterior margin of promotum is ornamented with a very dense tuft or fringe of strong hairs; hairs of antennæ and legs for the most part fine and long. It is silvery gray in color, marked with violet-purple, lighter on antennæ, except base of lower joints, femora and tibiæ, with spot connecting antennæ, light purple; anterior and lateral margins of thorax spots along side of the body, hind margin of second, third and fourth abdominal segments, lateral spot on middle of third segment, dark purple, sometimes appearing almost black.

One-third and one-half grown specimens do not differ from the adult notably, except in size and very slightly in coloration. In the illustration the head is bent up more than in its normal position in state of rest, the mouth parts are very difficult to work out. The labrum is simple. The right and left mandibles differ notably in the character of the teeth on their inner edges. The maxillæ and labium are of similar structure, consisting of large basal lobes, apically covered with long and

rather dense brushes of hairs. The food of the insect is probably moist vegetable moulds.—*Canadian Entomologist.*

Brains in the Finger Tips.

The blind are able to see, and apparently to get thoughts with their fingers. Prescott, the great historian, says: The blind man sees little outside of the circle drawn by his extended arms, but within that circle he sees more than those whose eyes are sound."

By resting the finger on the throat of a singer, a certain blind person can follow notes covering two octaves with her own voice, or by placing her hand on the frame of the piano, she can distinguish between two notes not more than half a tone apart. By moving her hand over the face of a visitor she is enabled to detect shades of emotion which the normal sensitive eye cannot differentiate.

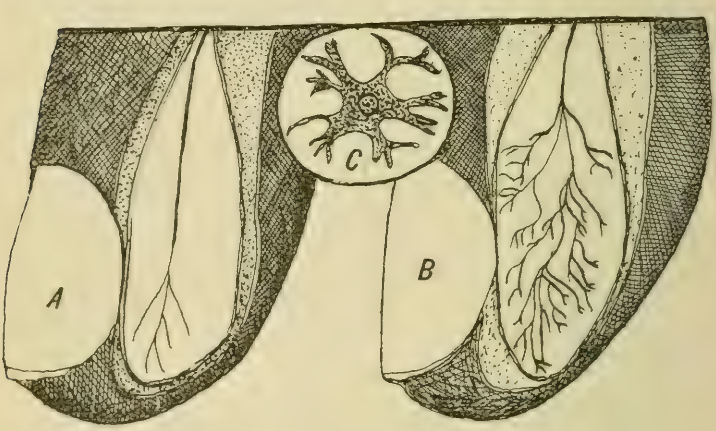
It has been reported that gray matter brain-cells of perception have been dissected out of the finger tips of the blind.

If you will examine the inside of your finger-tips with a magnifying glass of even moderate power you will find the skin all in ridges, which preserve the shape of the finger-end. Standing point up beneath all these ridges in the tactile surfaces of the skin are the so-called corpuscles of Pacini. These corpuscles which are arranged in the exact semblance of the keys of a piano, are said by Meissner to crepitate and give forth a different sound in every age of each person.

This Pacinian corpuscle contains within its lining membranes a nerve-trunk, an artery, and a vein.

It lines all the tactile surfaces of the body, particularly the inner finger and thumb tips. The illustration (fig. 1 a) represents the corpuscle. The artery and vein are omitted for clearness.

A medical man was recently present and assisted in an autopsy on a person, blind from birth, who had acquired a marvellously delicate "piano touch" during life. He wished to discover by scalpel and microscope why the blind man had such an extraordinary sense of touch. The inner surfaces of the index and middle fingers of the right hand were carefully sliced off, so that sections of perhaps a sixteenth of an inch in thickness were ob-



BRAINS IN THE FINGER TIPS.

a Nerve in the finger of average man.
b Brain cell-like nerve in blind man's finger.
c A grey matter cell in the rind of the brain,

tained. These were carefully placed on a slide and examined under a high power.

Instead of a single nerve trunk and artery and vein as is found in the finger of the average man (fig. 1 b), there was the delicate and complex ramification of nervous filaments shown (fig. 1,c). An immense number of dainty and minute nerve twigs branching off from the main stem are to be seen.

The extreme and constant employment of the finger-tips in the blind causes the blood to tend toward them in unusual quantities; this causes the extraordinary growth of the potential contents of the corpuscles of Pacini its nerve trunk, artery, and vein—and this larger and more perfect growth means more and more perfect performance of function.

A Word To Microscope Workers.

The Curator of the Colombo Museum, has for some years been making experiments so as to discover a medium which will preserve the colors of fish and other animals. This is what he says:

"In my last year's report I made some remarks on the use of carbolised oil as a mounting fluid for specimens already prepared by other means, the idea that it was a preservative in itself not having occurred to me. Further experiments this year seem to show (I do not like to speak too confidently in a climate like this, even with twelve months' experience) that it is one of the most perfect preservatives known both for form and color.

"Cocoanut oil and carbolic acid freely mix in all proportions. The mixtures at present under trial are oil raised to the specific gravity of 10° and 20° below proof spirit by the addition of acid. While the gum and glycerine process is absolutely useless for any animals except certain families of fish, this mixture is good for every kind of vertebrate. The most delicate frogs are quite uninjured by it, and snakes undergo no change. The delicate plum-like bloom on the geckoes, the fugitive reddish tint on such snakes as *Ablabes humberti*, are beautifully preserved by it.

"Another most important use is in the preservation of large fish skins, which can be packed away in it for an indefinite period, and mounted when wanted. These kinds

do not require varnishing, neither do they turn brown, but although, of course, they do not perserve their sheen like fish in the oil itself, they always maintain a silvery and natural appearance, quite different from that of ordinary museum specimens. If ever we get a new fish gallery, a show of our large species prepared in this way would form a most effective exhibition.

"It appears also to be a most excellent preservative for crustacea and the higher orders of arachnids, and also for centipedes, but it has hitherto proved a failure for marine invertebrates in general. It must be remembered, however, that the perfect miscibility of the two liquids opens endless possibilities. Its absolutely unevaporable nature makes it invaluable in a tropical climate, quite apart from its other qualities.

"With regard to this last remark, I take the opportunity of stating that the acid enables cocoanut oil and turpentine to be mixed together. This forms a splendid microscopic fluid, in which objects may be allowed to soak without any previous preparation; and in which they become very transparent. A minute species of crustacean, of the order Copepoda, and the leg of a fly, simply laid on a slide in a drop of this fluid and covered with an ordinary covering glass, without any cell being made or cement employed, have lain on my table unaltered for the last ten months, and I cannot help thinking that such a medium as this cannot fail to prove a great boon to all workers with the microscope."

Palpal Organs of Spiders.

BY THOS J. BRAY.

PITTSBURG, PA.

A short time ago a friend sent me a mounted. object for examination, stating in his letter accompanying it, that it was a spider with the funnyest arrangement on its

front feet that he had ever seen, and that as far as he could make them out, each foot had a lariat to lasso its prey and a piercer to kill it with, and he had labelled the slide "Tree spider with lariat and piercer." Upon examining the specimen I found that it had all the characteristics of a spider, and there was upon its palpi, or feelers what looked very much like a lariat coiled up ready for use, and sure enough there was a claw or piercer on each palpus, and as the palpi are used for conveying and preparing food it was reasonable to suppose that their use was in that direction. This would be the natural inference of one who was unfamiliar with the strucure and habits of spiders.

I proceeded to investigate the subject before accepting the above opinion, and in the Encyclopedia Brittanica, Art. Arachnida, I got some light upon the subject, and much to my surprise learned of the strange use of these peculiar organs. Later on I procured a little book entitled: "The structure and habits of Spiders by J. H. Emerton," and as it describes the use and operations of these organs fully I will quote verbatim, for the benefit of those who have not access to the books.

"The peculiar organs by which the adult males and females can always be distinguished are in the males, the palpal organs, on the ends of the palpi and in the females the epygnum. "As the male spider gets nearly full grown the terminal joints of the palpi become swollen, and after the last moult the palpal organs are uncovered.

The simplest form of palpal organ is found in the large mygalidate. It consists of a hard bulb drawn out to a point in which is a small hole leading to a sac within. In most spiders the terminal joint is flattened, and has a hollow on the under side in which the palpal organ is partly concealed. The bulb is flattened to fit this hollow, and the point of it is prolonged into a distinct tube of

various shapes furnished with numerous spines and appendages."

Then in figure 48 it shows the palpal organ of another spider which very much resembles the mounted one under examination. The writer says: "Fig. 48, is the palpus of another spider where the outer tube is so long that it is coiled up over the basal part of the bulb: (the lariat) and the end rests on a strong spine (the piercer) at one side of the palpus.

Not only the terminal points of the palpi but also the next; and sometimes the next two joints are modified in shape with the development of the palpal organ. The shape of these organs is very constant in the same species of spider, and thus becomes one of the most convenient marks of such a group."

The uses of the palpal organs are indicated in the following quotation: When the reproductive cells of the male spider are mature, he discharges the liquid containing them on a little web spun for the purpose, dips his palpal organs into it, and in a few moments takes up the whole, it is supposed into the little sacs, inside the bulb. Then he seeks the female and inserts the palpal organs into the epygnum.

The soft part at the base of the organ swells up, and presses in the discharge tube and probably forces out the contents of the bulb into the spermathecal from which it escapes in course of time into the oviduct, and fertilizes the eggs about the time they are laid. One palpal organ is usually inserted at a time, and after a while taken out and replaced by the other: this change may be repeated many times by the same spider."

To Drill Holes in Glass.—Moisten a spot through which the hole is to be made with a mixture of 25 parts oxalic acid and 12 parts turpentine. Keep in a cool place. The hole may be made with an ordinary drill.

Microscopic Microscopy.

T. O. REYNOLDS, M. D.
KINGSTON, N. H.

It is to amateurs again that I would address myself· Were you studying geography and wishing to know in detail the map of your own county it would be better if you first saw as a whole, a map of North America. Then take the United States; next your own state and later, an enlarged map of the county you desired to know thoroughly.

Just so in microscopy. So much more good can be had with low powers. The use of a two inch or one inch objective gives you the "North America" of your investigation. Then by reducing your field of investigation you not only have a better knowledge of the *locus*, but are astounded at the amplification you get of minutiæ.

Most novitiates "thirst" for high powers. Let me suggest: You ought not to have them.

A good low power with proper study put on the subject under investigation will teach much more of nature than a higher power illy understood.

And who can understand a high power but one who has delved in the labyrinth of experiment. Don't do it at first. Learn to love the object sought and bless your microscope afterwards.

This leads me to say something which took me years to find out. Most first purchasers of a microscope delve at it for the pleasure they get out of the magnification. The joy of seeing a fly as big as an elephant! A hair as big as fence stake! But this is not microscopy. One should have a definite aim in view; something you desire to know; something you really want to find out; a desire to advance in your knowledge of the material universe of things.

Then, the microscope becomes merely a means, an instrument to the furtherance of your mental object. This is microscopy.

Stop worshiping the instrument and this and that objective. Stop getting elated over "resolving amphipleura pellucida." Go to studying books on the classification, life history, generation, growth and place in nature of a few denizens of this world of ours, unknown to natural vision. Then and not until then will you find the true field of a microscopist.

The idea of being able to handle a microscope well means to be able to use it to the best advantage, to make it reveal what in nature you are studying and cannot see without it. Books and study are the chief objects operative if one would improve in the "Art" of Microscopy. First, love nature; then desire to know more about nature, and as you get on and plod on and struggle on this most delightful road of blind attempts to fathom mysteries, the Microscope will help, merely hely you; will be your best of friends; will be such a friend that you will never part with it, and then you will be able to realize what the Microscope is for and that it is for nothing else.

EDITORIAL.

A Winter Observation.—During the warm weather of Jan 1, the ice on a sunken barrel had melted sufficiently to admit of being turned. From the under side were collected some straws covered with a green slime as well as some which were brown and covered with a sediment. The green proved to be beautiful fresh water algæ in different stages of growth. From the brown, by scraping it onto a slide were obtained many forms of living diatoms, known by their stately movements. Some desmids also were present and easily distinguished by their quick jerky movements and their green color. Besides these were numerous colorless bodies in motion. Several fresh water algæ were attached to bits of solid matter which had come off in the scraping.

Lard Adulteration.—Purity is desirable in all things, but demanded in articles of food, and yet, in the one article lard, adulteration has been carried to an extent that is appalling. The following extracts clipped from daily papers will give some idea of the facts.

New York Commercial Bulletin:

"An expert examined and reported upon a sample of Western Refined Lard the other day, which he said did not contain a pound of hog fat, but consisted of tallow, grease, cotton seed oil and oleo stearine."

Also, same paper:

"We have a law in this State against the sale of Oleomargarine for Butter, yet that, and cheaper articles, are put in Refined Lard, as made in Chicago, and at other western cities, and sold for pure Lard to and by the grocers of the city. How is it the Chicago mixers will sell the so-called Refined Lard a quarter of a cent under price of raw, crude Lard, when refiners will admit that it costs a half-cent per pound to refine it, thus showing undoubted adulteration on a scale that should attract the attention of the health authorities?"

Gum Thus.—We are informed by Mr. Lewis Woolman that gum thus is nothing in the world but lumps of white turpentine which any druggist can pick out of his stock for you. Simply cull the white lumps.

The subscribers of this magazine can obtain the Columbia Calendar for 1897 by addressing five two cent stamps to the Calendar department of the Pope Manufacturing Company of Hartford, Conn.

The German Emperor has conferred a decoration on M. Roux, for his discoveries in relation to the antitoxin of diphtheria. M. Roux has accepted the honor. His master, Pasteur, refused the German order of merit, declaring that he could never forget 1870.

Dr. Luys, of the Salpetriere Hospital Paris, has presented the Faculty of Medicine with his collection of twenty-two-hundred brains, carefully prepared and catalogued.

PRACTICAL SUGGESTIONS.

BY L. A. WILLSON,

CLEVELAND, OHIO.

Any Easy Method of Seeing the Minute Structure of Fossil Wood.—Receiving a small lump of fossil wood from a sub-carboniferous deposit, wrapped in paper, I noticed a small amount of dust fallen from the fossil into the paper. Placing a small amount of this dust upon a slide in a drop of water, covering and filling the space beneath the cover with water, I was rewarded by the sight of round cells each of which contained a well defined passion cross. It was a beautiful and instructive sight. Some of the pieces were dark and opaque but the portions exhibiting the cells were of a light brown color and thin enough for examination under a high power. The specimen seemed to be a mixture of carbonaceous and siliceous rock of a denser structure than coal.

Another specimen was white and composed almost entirely of silex. Quite large specimens of the latter flaked off and were thin enough for examination under a fifth or a quarter objective. They mounted well in balsam and exhibited the bordered pits of the coniferae. The dust in the first specimen could be easily obtained by scraping.

Trachea.—The Trachea or air tubes of insects are interesting and beautiful objects. They are more easily obtained from the larvæ. To obtain them, make a small opening in the body and then inject into the opening strong acetic acid, this will soften and decompose all the viscera, and the trachea should then be well washed with a syringe and removed from the body. This latter process may be easily effected by cutting away the connections of the main tubes with the spiracles by means of fine pointed scissors. Then place the body upon a glass slip, flood with water when the trachea will float out. Then lay them out and place them in their proper positions with needles; dry well, soak in turpentine and mount in balsam. The best

specimens are found in the larva of the dytiscus, cockchafer, blow-fly, goat moth, silk worm and house-cricket.

Iodo-Sulphate of Quinine.—This beautiful crystillization for the polariscope may be prepared as follows: Mix 3 drachms of pure acetic acid with 1 drachm of alcohol; add to these 6 drops of diluted sulphuric acid (1 to 9.) One drop of this fluid is to be placed on a glass slide and the merest atom of quinine added, time given for solution to take place; then upon the tip of a very fine glass rod a very minute drop of tincture of iodine is to be added. After a time the polarizing crystals of iodo-sulphate of quinine are slowly produced without the aid of heat.

Crystalizations of Santonine.—Santonine may be procured from any drug store. It is a vermifuge. It is an alkaloid derived from Semen Cynae or worm seed. It is soluble in alcohol, chloroform and water. Each solvent alters the character of the crystalization. With chloroform it assumes a lace-like appearance; with water it arranges itself in tufts composed of small oblong plates arranged around a nucleus; crystallized on a hot slide crystalizations radiating from a centre will be formed.

The Difference Between Crystals and Crystalization: A crystalization is an arrangement of the particles of a substance composed of many thousands of crystals. Nearly every substance has a definite manner of crystallizing. The individual crystals always belong to a certain system. To detect the substance and to determine an adulteration beyond all doubt these individual crystals should be obtained.

SCIENCE-GOSSIP.

Microbes in River Water.—Mr. Hawkins, the bacteriologist to the Indian Northwest and Central Provinces, states, in *The Pōpular Science News*, that, from bacteriological observations that he has made, he has come to the conclusion, that, whilst in England, the more muddy a

water is the larger number of microbes it contains, in India the contrary is the case. The thick turbid water of the Ganges on the Jumna is commonly better, bacteriologically than that of the Elbe at Hamburg.

Danger in Towels.—A case of infections disease for which the physicians felt unable to account in any way gave a start to this investigation. In the same office where the patient was employed was a janitor who was suffering from the same disease. The physician Prof. Balleston secured the soiled towels and upon examination a colony of bacilli of the same sort were found. These towels were furnished by a company who furnished thousands of towels all over the city. Half a dozen were examined with no result except a few harmless microbes, but later a very innocent looking one was found to contain disease germs of the most horrible description. It was found that many towels have so slight an appearance of soil upon them that they are simply run through the soap suds, rinsed, dried, and mangled. In one case a profuse crop of pimples was traceable to the use of one of these towels when the face was moist with perspiration.

A towel showing a very slight stain—not enough to cause the casual observer to think of investigating it—was the object of suspicion to a microscopist. The spot was cut out and subjected to the culture process. As soon as it came in contact with moisture, the spot, which had been ironed down smooth and flat, swelled to considerable proportions, and showed a large number of dangerous microbes.

Silver Crystals.—To make these pretty objects for microscopic examination, dissolve a crystal of silver nitrate in a few drops of rain-water. Put a drop of the solution in the center of a glass slide, and place it on the stage under a low power, concentrating the light on it from above. Now take a bit of clean copper wire about one and one half inches in length and bend it in the shape of the letter L, making the shorter end just long enough to project into the edge of the drop from the edge of the slide. Bend the longer end into a hook which will catch on the

upper edge of the slip and hold it firmly in place. Bring the short end into the edge of the drop. In a moment, chemical decomposition of the nitrate occurs and the pure silver in exquisite crystals attaches itself to the copper. If the solution is strong enough, the formation will go on until the branching, feathery crystals extend quite over the space occupied by the drop.—National Druggist.

NEW PUBLICATIONS.

The New Monthly Open Court.—With January, 1897, the Chicago *Open Court* celebrates the decennial anniversary of its nativity, and appears in the form of a monthly instead of a weekly. Undoubtedly this change will gain more than ever the attention of thoughtful people for *The Open Court*, which is devoted to tha high ideal of purifying religion by the methods employed in science,—an aim which it has always reverently but fearlessly pursued.

The January Monist.—Three powerful articles make up the main bulk of the January *Monist*,—the first on *The Logic of Relatives*, by Mr. Charles S. Peirce, a celebrated American mathematician and creator of this branch of inquiry, the second on *Animal Societies*, by Dr. Paul Topinard, the eminent Parisian anthropologist, and the third on *The Philosophy of Buddhism*, by Dr. Paul Carus, the editor of *The Monist.*

New York Agricultural Experiment Station.—Bulletin No. 110 of the N. Y. Agricultural Experiment Station (Geneva) is entitled "Milk-Fat and Cheese Yield." This bulletin contains a discussion of results secured in making analysis of the milk of 50 herds of cows, whose milk was taken to a cheese-factory. The results form a basis for discussing methods of paying for milk for cheese-making. The conclusion reached is that payment for milk according to amount of milk-fat furnished is the fairest practicable method.

THE MICROSCOPE.

Contents for January, 1897.

THE MICROSCOPE

FEBRUARY, 1897.

NUMBER 50 NEW SERIES

Objects Seen Under the Microscope.

By CHRYSANTHEMUM.

XXXVII.—Snow and Ice Crystals.

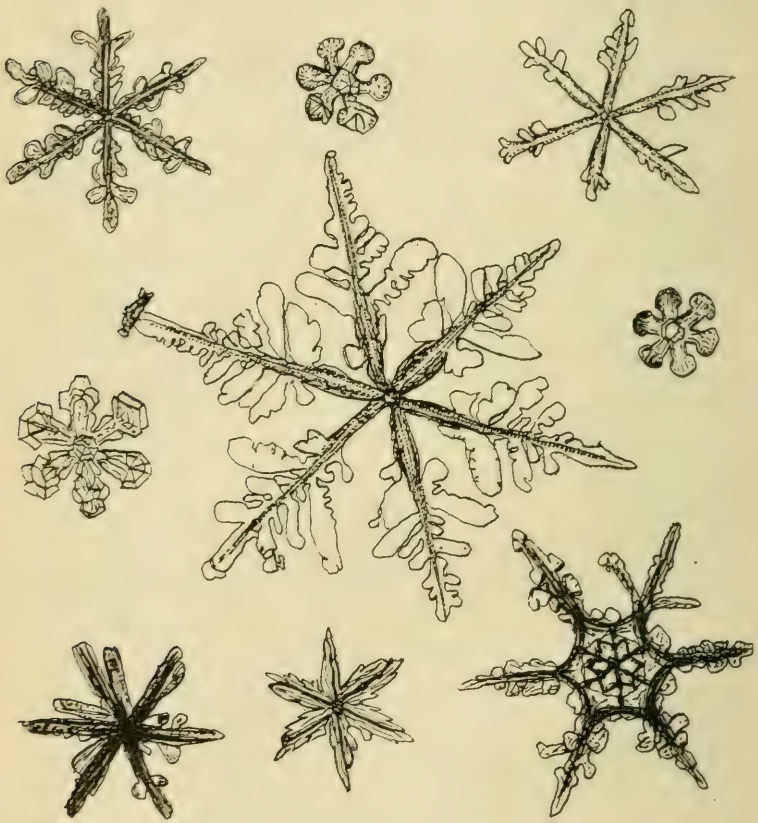
Ice formations, snow crystals, and hoar frost have been subjects of study since the sixteenth century. In the year 1555 the learned Olaus Magnus, Archbishop of Upsala, published a book containing an illustrated chapter on snow crystals; but he overlooked the fact that crystals are six-sided. The great Kepler published in 1661 the first special work on these crystals. It was devoted mainly to the description of new shapes and figures rather than to that of their hexagonal from.

Other early chemists and physicians described them in their own way. One French man, Fabri de Peiresse (1623) was of the opinion that they came from seeds, like plants and animals.

Dr. Hellmann has recently published a work in Berlin in which he gives a synopsis of all that has been done in this direction. From the primitive drawings of Magnus to fine illustrations of the present day, the most beautiful given are by an English meteorologist, James Glasher. But these are ideal rather than real, as the true crystals do not have the six arms of equal length. Perfect crystals can form only when the molecular action is undisturbed, but this condition cannot exist in a snow storm. The upper strata of the atmosphere is invariably in a state of motion; in the region where snow crystals

are forming, winds, lighter or stronger prevail, and the formation of irregular crystals on the side towards the storm is thus promoted.

Dr. Hellmann's work is illustrated by photo-micrographs by Dr. R. Neuhaus. They are enlarged from ten to thirty times and are eminently realistic. It is



from these that our figures are copied. It is well to notice the irregularties in the length of arms and in the formation of the arms.

To examine snow crystals the work is better done in the open, as they evaporate rapidly in a low temperature,

and even a perfectly cold room is warmer than the out of door temperature.

Have the slides cold and dry and the instrument arranged with the polariscope and focussed as nearly as possible. Then catch the crystals on the slide as they fall and examine them without delay. Snow crystals, but a short time after falling, break, the broken pieces freeze together and crystalization is destroyed.

The light during a snow storm is not suitable for photo-micrographic work. As an artificial light, the petroleum lamp is preferred. To prevent heat action emanating from the illuminating ray cone, an absorptive cell of alum solution should be interposed. As alum solution freezes solid in −5 deg. R., chloride of sodium is added. With Hartnark's projection system (31 mm. focus distance), from 5 to 7 seconds upon an erythrosine plate is ample.

Dr. Neuhaus' pictures of ice crystals much resemble those of hoar frost, deposited after a cold winter's night. Of snow crystals the doublets are highly interesting, two crystals having merged into one, and those having passed through a moist stratum of air, when microscopic drops of water will freeze into the hexagonal form, giving the picture an appearance very much resembling a cauliflower.

The cause of the various forms of hexagonal crystals, which often change in the same snow storm, is a question which it is difficult to answer. Dr. Smallwood has traced an apparent connection between these various forms and the electric conditions of the atmosphere, whether negative or positive. Dr. Hellmann says: "It is better to acknowledge that we know nothing positively in regard to this. In our knowledge of the form and structure of the snow we have made great advance since the time of Kepler, but, after nearly 400 years we cannot give a satisfactory answer to his question: "Cur autem sexangula?"

We have found that a low temperature favors the formation of tubular crystals: a higher temperature the star-shaped crystals; but these groups show such different forms that it is necessary to seek other causes. Here is a broad field for investigation and study.

Silicon Dioxide.

By W. S. BEEKMAN.

WEST MEDFORD, MASS.

Among the grandest developments of a most subtle molecular aggregation, nothing issues from the Laboratory of the Unseen Architect, possessing more interesting features, than Silicon Dioxide.

An invisible gas, and a silvery metallic looking substance. We must suppose, the mystic interposition of a Titian Alcahest, and then these two most peculiar substances, amalgamate.

Among the most intense degrees of exquisite gem limpidity; among the most gigantic examples of mathematical refinement; among the most gorgeous displays of light interference; this blending of two such strange characters excels.

Have you ever feasted upon the extreme magnificence presented by the combinations of crystal splendor, for which, from among all other things, quartz seems to be the most plentiful example.

As among people, so among Rock Blossoms, are the peculiarities induced by each different locality. So faithfully is it wrought into its substance, that a collector needs but see a specimen to almost locate it.

The limpidity of Japanese quartz; the transparency of of the highest refinements of North Carolina quartz are one and the same thing; yet one soon detects which is which.

The crystals from Hartz Mountains; and the crystals from Pike's Peak ; they may be both pellucid solidifica-

tions of a coffee-jelly color; but yet they can be easily placed.

It is a fascinating contemplation. If one has not access to a private or public collection, perhaps the best substitute to seeing specimens may be found in reading about them. Books are always accesible. In a grand bit of pleasant-science, Ruskin has portrayed in word-pictures, beautiful ideal suggestions, which are of value to every lover of Nature and particularly of quartz.

The crystalline is not so patiently investigated, as is the amorphous form of silicon. The microscopist studies a form of rearranged quartz molecules.

Grandeur is still before the investigator. Precision becomes no less precise. The framework of molecules of protoplasm; and masses of protoplasm; in their glassy outlines, add to the voices which proclaim the universal mystic transmutations. Crystalline life discloses mystic inherent forces; and the bits of jelly, quivering with a different degree of sensitization, weave their typical pattern of threads with unvarying constancy.

In the magical weaving of siliceous threads to produce a "Venus Basket," one needs no microscopic penetration to see wonder and beauty, in form and structure. The Euplectella is a magnificent production. The Diatom skeletons are at the other extreme in magnitude. The very highest art of man, concentrated to its utmost point, displays the marvellous designs of the Diatom skeletons. We reach the threshold of newgrandeur, and find ourselves beyond our depths in mysticism.

Rarely has Nature made provision for the microscopist in supplying exquisite crystallizations of quartz groupings, which will combine all the imitable features of purest forms. Magnificence and minuteness combined in little double terminated brilliants, make pleasing slides.

The best examples the writer has yet found, were shaken out of chalcedony concretions. The crystals are

double terminated, and often show calcites attached. Two slides should be made. One as opaque mount and one mounted in diluted glycerine, as a "rolling slide."

Stamped envelope, will enable any reader of this paper to secure enough for making such mounts.

Regarding Crystals.

T. O. REYNOLDS, M. D.
KINGSTON, N. H.

The article on Iodo-Sulphate of Quinine in the last issue of the Microscope, attracted my attention. I had had the same or similar directions from books a score of times and many scores of times had I, as carefully as a man well could, tried to obtain the so called *Herapathite.* I just could not do it. A good microscope, plenty of accessories, a good polarizing apparatus and some experience in crystalography, but no Herapathite, or no typical Iodo. Sulph. Quinine crystals. What was the matter?

If you want a slide or two that transcend the beauties of any rainbow, dissolve a little Santonine in boiling Canada balsam and cool slowly. Then the radiate colors, the nuclear centers, the brilliant irridescence, changing under the rotating nicol will be a feast. Sulfonal gives unique effects under differing treatment. Crystalized from cold (water) solution, from hot solution, from balsam hot, from chloroform balsam heated, from hot glycerne, all have their peculiarities, beautiful, enchanting, instructive.

White's Objects.—About five years ago you sent me a line of these specimens which I have mounted and esteem as about the most interesting and valuable part of quite a large collection of objects. I enclose two dollars for more to be selected from the list of numbers I enclose.

C. M. Marvin,
New York City.

Practical and Economic Side of Bacteriology.

By L. E. SAYRE.
UNIVERSITY OF KANSAS.

[Abstract]

When it was shown over a century ago, that putrescible liquids could be perserved almost indefinitely by first boiling them and then excluding the atmospheric air, perhaps little more was expected from this experiment than its practical application in the preservation of foods. In hermetically sealed contrivances these would be kept unchanged till wanted. To-day there is a new department of biology based upon it.

The life history of different species of micro-organisms has been studied as minutely as if they were plants from the higher orders of the vegetable world. The amount of heat required to destroy many of them has become accurately known. It is asserted that cholera spirillum is destroyed by ten minutes exposure at the temperature of 52° C; the typhoid bacillus by 60° C; and from this is drawn the practical conclusion that clothing infected with any of the above, could be speedily disinfected by being immersed in water at 70° C, or above, and then would be without danger as far as the disease germs were concerned.

The practical results coming from the study of the micro-organisms, as they manifest themselves in the infectious diseases among domestic animals, have been increasingly astonishing and gratifying. No infectious disease among domestic animals, such as glanders, tuberculosis, swine plague, and hog cholera, is treated to-day without first consulting the latest developments from the bacteriological laboratory.

A practical application of bacteriology for economic purposes was successfully made when bacterial poison was cultivated for the purpose of destroying field mice. To the farmers of Europe the destruction of these pests was

the greatest boon. By distributing in the grain fields, bread moistened with a culture of a certain bacillus a fatal infectious disease is caused among the animals. The mice which consume the bread die within a short time. Their dead bodies are consumed by other mice, and these become infected in turn. Thus an epidemic is induced by which hosts of field mice are vigorously attacked and their numbers greatly reduced.

Another and important application of bacteriology for economic purposes in this country includes the experiments made for the destruction of the chinch bug, (fig. 1),

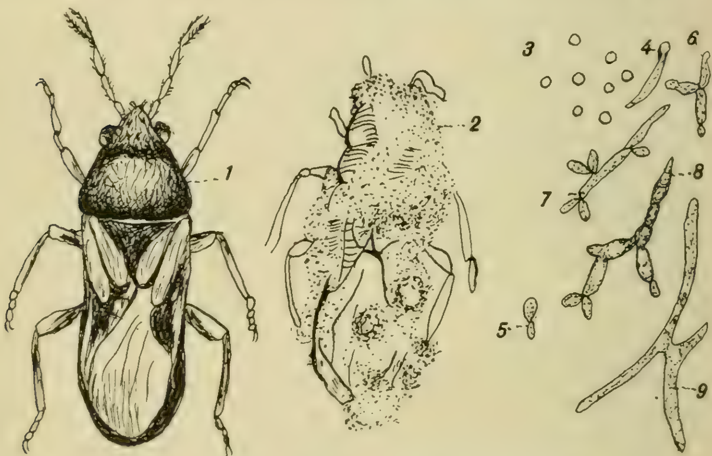


Fig. 1.—Chinch Bug x 40. Blissus leucopteras.
Fig. 2.—Diseased Chinch Bug attacked by the parasitic fungus, Sporotrichum globuliferum.
Fig. 3.—Conical spores of Sporotrichum globuliferum x 470.
Fig. 4.—Germinating spore x 470.
Figs. 5 to 9 inclusive. Conidial spores in various stages of development.

by artificial means ; not exactly by the cultivation of bacterial poison, but by cultivating from the spores, a parasitic fungus, (fig 3) which is as rapid in its destruction as any bacterial poison would be.

The chinch bug may be well known as a minute insect

infesting cereals, principally corn and the small grains, wheat, rye, etc. This apparently insignificant winged animal has destroyed hundreds of acres of our western grain fields. A field of corn may have a most promising green thrifty look today, but in a few days after the attack of an army of chinch bugs nearly every stalk of the corn field is deadened and finally falls lifeless to the ground; the insects have extracted the sap of the plant and thus drawn from it, its life blood.

When these pests were at their height it was discovered that an epidemic had set in among them. Dr. H. Schimer was the first to discover this disease in 1867. Several years later, a practical use was made of such diseases in destroying these pests on a large scale.

It was found that the spores of the fungus, Sporotrichum globuliferum could be propagated in gelatin, on potato, or on any organic matter in fact; thus unlimited supplies were possible. It was only necessary to transfer colonies of the spores to the corn fields, and these under favorable circumstances, would come in contact with the chinch bug, cause infectious disease and exterminate the pests in a few days. An experiment station was formed in Kansas where farmers could obtain these infected bugs upon application and it is estimated that in 1891 $80,000 was saved to the 444 farmers who used this remedy.

In the course of a few years, it was found that there was a serious drawback to the artificial propagation of the parasitic fungus on a large scale. It was absolutely essential that the meteorological conditions must be favorable, a certain amount of moisture must be present in the atmosphere to insure the spread of the disease. As these conditions are uncontrolable it makes the artificial spread of the disease impracticable from an economic standpoint.

EDITORIAL.

Dr. R. H. Ward.—At the annual meeting of the Troy Scientific Association held in the Unitarian Church, Troy, N. Y., January 18, 1897, the president, Dr. Ward delivered an address on Library methods and expedients with special reference to the use and usefulness of the microscope. The meeting was largely attended and the speaker warmly applauded.

Dr. Frank L. James.—Last fall, while testing a new and extremely brilliant light on an evening (October 27) when the heat necessitated having the windows open, Dr. James met with an accident to the left eye which entirely incapacitated him for a time. He has received many letters of condolence and has been unable to answer but few of them. He desires us to say to his friends that though improving constantly it will be impossible for him to write much more than his official duties require.

In the act of extinguishing the light he was struck by a large beetle which was flying with great swiftness. The antennæ of the beetle were driven into the ball of the eye, the lower half of the cornea being smashed. One of the horns of the insect was left imbedded therein. This injury has healed but a scar is left so large and deep that the usefulness of the organ is destroyed. There is not the slightest hope of recovering its use. During ten weeks the wound caused constant pain. Of course all use of the microscope has been interrupted. We trust that the worst is over and that our colaborer will in some way be able to find an application of the law of compensation for what seems to human thought so great a misfortune.

Dairy School.—The New Hampshire College of Agriculture and Mechanic Arts announces the third session of its Dairy School, which will be held throughout the winter. The course consists of instruction in dairy husbandry,

milk testing, butter making, dairy bacteriology, dairy engineering and the breeding and feeding of dairy cows. The course on dairy bacteriology will consist of lectures upon bacteriology by Dr. H. H. Lamson and of practical demonstrations under the direction of Mr. C. H. Watterhouse.

The object of these courses is to make the students familiar with both normal and abmormal fermentation in butter, milk and cheese; with the methods of controling these fermentations and preserving milk for economic purposes, and with the cultivation and general treatment of bacteria in the dairy.

They also have a complete Pasteurizing plant which is used for the instruction of the pupils.

Correction.—In the January number the title of Dr. Reynolds' article should read Macroscopic Microscopy, or "Big littleness." By Microscopic Microscopy is meant "Little littleness."

PRACTICAL SUGGESTIONS.

By L. A. WILSON,

CLEVELAND, OHIO.

Acineta flava.—This strange but interesting infusorian is generally found floating on the surface of a gathering of water. It is usually found in the early spring. It is figured in plate II, figure 2, of the Proceedings of the American Microscopical Society of 1886 on page 38.

The animal has a triangular lorica with a long slender pedicel and twelve knobed tentacles, six on each side of the lorica. It is found in the water of the great lakes. It is sensitive and timid and at the slightest alarm will retract its tentacles. The lorica is the 1-260 of an inch in length.

Asterionella.—A species of this diatom is almost constantly found in the gatherings from the waters of the great lakes. It is most abundant in the sediment. When

alive and fresh it is a very pretty diatom. It is in the shape of a wheel without the rim, the hub and eight spokes, three above, three below and two horizontally extended one on each side of the centre. These spokes are ornamented with alternate patches of golden yellow endochrome.

The Examination of Cloth.—When samples of cloth, claimed to be all wool, all silk or all linen are desired to be examined, take a piece of one of the threads pick it apart with needles, place it on a slide in a drop of water, cover and examine. A power equal to a quarter inch objective is necessary. The view will be best when too much of the material is not examined at once. It will be necessary to examine the warp and the woof and the different threads apparent to the eye. If the examiner is familiar with the appearance of the different fibres, frauds and adulterations will be easily detected.

The Examination of Objects in Water.—When a gathering of water is made it will readily occur to any one to examine the sediment but many fail to examine the specimens floating on the top. Frequently the objects on the surface will be unobserved when viewed directly but when held so as to be observed obliquely many little specs will often be seen. These specs will frequently be found to be the most interesting of the entire gathering. They should be dipped out with a spatula and transferred to a shallow cell, and first viewed with a low power. In this way may be found small crustaceans, as Daphnia pulex, Bosmina and Ciliata as Anurea longispina and such diatoms as Rhizoselenia.

SCIENCE-GOSSIP.

Where to Find Microscopic Material.—Sweepings from back yard fences, from cellar walls and out of the way places are fruitful fields for microscopical material. We can not only find insects, their cocoons and eggs, but many

forms of plant life, such as lichens, protococcus, and various kinds of fungus and mosses all of which are interesting and instructive.

At the London Institute on Dec. 4, Mr. F. Enoch, F. L. S., delivered a most interesting lecture on "The Wonders and Romances of Insect Life" as portrayed in the life histories of some of the insects common in every London back garden. The fifty illustrations shown upon the screen were the handiwork of Mr. Enoch, each one a study from nature, showing the metamorphoses of the various insects. Many of the marvellous insect egg parasites have been discovered by the lecturer, who is engaged upon a monograph of this most interesting but neglected family.

Excellent Paste.—This can be produced as follows: four parts of glue are soaked a few hours in fifteen parts of cold water, and moderately heated until the solution becomes perfectly clear, when sixty-five parts boiling water are added while stirring. In another vessel thirty parts boiled starch are previously stirred together with twenty parts cold water, so that a thin, milky liquid without lumps results. The boiling glue solution is pored into this while stirring constantly and the whole is kept boiling another ten minutes.

Bacteriology of the Hair.—Dr. L. Brocq (Journal of Cutaneous and Genito-Urinary Diseases) says that when the bacteriology of the hair is taken up various microbes are found in it. Six are, however, discovered quite constantly. These are: (1) a white fungus; (2) a yellow fungus; (3) a bacillus subtiliformis; (4) a bacillus in the form of a boat, staining with difficulty; (5) a special micrococus, which Sabourand designates provisionally under the name of Micrococcus cutis communis; (6) the spore of malasses, the flask bacillus of Unna, which he calls the bacillus asciformis. These two microbes, which appear to be the most important, are found in seborrhoics who are not attacked with alopecia areata. No one of these microbes would have the importance of a casual agent in the disease.

RECENT PUBLICATIONS.

Biological Work.—Dr. H. B. Ward has published the Sixth Bulletin of the Michigan Fish Commission. It contains the records of work done by Dr. Ward and by five others. Aquatic Plants are treated by H. D. Thompson, the Protozoa by Dr. C. A. Kofoid, the Rotifera by H. S. Jennings, the Turbellaria by Dr. W. McM. Woodworth and the Molusca by Bryant Walker, the object of the work is the study of the life of Lake Michigan in all its manifold relations, but especially in those relations which bear upon the welfare of the food fishes.

Microscopy for the Farmer.—Among the recent contributions to botanical literature is a work (Maladies des Plantes Agricoles et des Arbres fruitiers et Forestiers causees par des parasites vegetaux. Paris, 1895,) on the diseases of agricultural plants including forest and fruit trees.

In his introduction the author speaks of the changes made in the methods of viewing plant diseases. And in speaking of the aims and purposes of the work he says:

"If I am able to render the study interesting and intelligible to agriculturists and to all persons living in the country and who have received some general knowledge of the structure of plants I shall have obtained the end I had in view."

Of the difficulties of studying minutes parasitic plants he adds: "It seems to be established that such researches present too many difficulties to be carried on by any one who wishes to do so. My greatest desire is to dissipate this belief and to facilitate the beginnings of observers who, living in the country, are able to test on cultivated plants the facts already observed and described and to examine the parasites in all the stages of their development. If they acquire a taste for these researches they may be able in their turn to add many new facts to science."

If he succeeds in getting the intelligent farmers to observe carefully the parasitic plants which destroy their crops, and to study and become familiar with the facts that have already been established by investigators, he will have rendered an incalculable service.

If the farmers both in France and America would study plants under their normal conditions, so as to become interested in them and in their physiological activities, they would then have a better knowledge of how to prevent or combat their diseases. Bnd it might not be long before the intelligent farmer would feel that a microscope was a necessity to the greatest success of his farm.

Appleton's Popular Science Monthly.—Under the title "A year of the x-rays," Prof. D. W. Hering tells in what directions progress has been made upon Rontgen's famous discovery. Some of the advances are indicated in the illustrations accompanying the article. Surgeon-General George M. Sternberg reviews our knowledge of the Malarial Parasite and other Pathogenic Protozoa, telling how they were discovered and upon what grounds they are accepted as specific infectious agents.

Pritchard's Infusoria.—We have for sale one copy of the latest edition of this beautiful work with colored plates. Price $30. Also Smith's British Diatomaceæ, two volumes, uncut. Price $30. These works are very scarce and can only be got, as in this case, when a microscopist from Europe finishes using them. We trust that some Scientific Society or Public Library will be desirous to possess them since they are very rare volumes.

Numbers eleven and twelve of Lloyd's Photogravures of American Fungi have recently been distributed. They represent respectively Lepiota morgani Peck and Sparassis herbstii Peck, two interesting species. The first was photographed as it grew in the field, and makes an unusually attractive and characteristic picture.

THE MICROSCOPE.

Contents for February, 1897.

THE MICROSCOPE

MARCH, 1897.

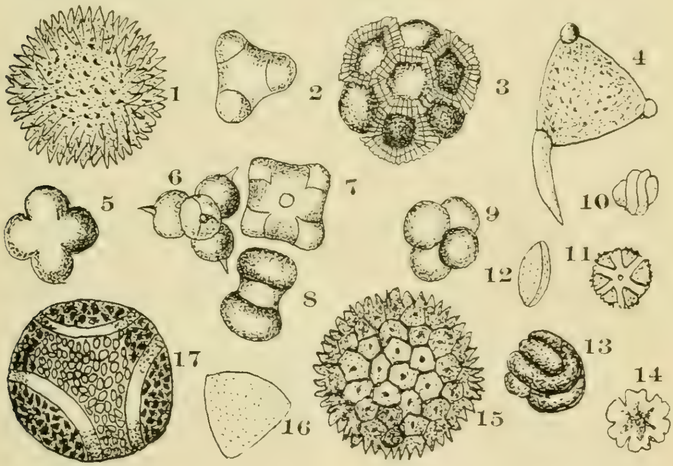
NUMBER 51 NEW SERIES

Objects Seen under the Microscope.

BY CHRYSANTHEMUM.

XXXVIII.—POLLEN GRAINS.

With the advent of spring come the flowers and there is no more interesting subject for study than the pollen. This is always better observed fresh from the plant, and



1. Althæarosea.
2. Willow Herb.
3. Scorzonera.
4. Willow Herb with pollen tube.
5. Crowfoot.
6. Rush.
7. Flax
8. Cedar of Lebanon.
9. Yellow Fumitory.
10. Musk.
11. Dandelion.
12. Snowdrop.
13. Mush.
14. Primrose.
15. Ipomæa purpuræa.
16. Tulip.
17. Passiflora cærulea.

makes a pretty subject viewed as an opaque object on one of its own leaves. The variety in shape and structure is very great, and interest will increase the deeper we go into the mysteries of plant life.

This dust, which to the unassisted eye, is all alike in every flower, is fashioned with the most elaborate care and sculptured with exquisite finish. It is the fructifying principle which causes the seed to become fruitful. The organs of generation in flowers are stamens and pistil. Stamens varying in number from two to upwards of twenty; and the pistil, which occupies the center of the flower, having from one to many styles, the upper part of which is called the stigma. The base of the pistil, which is swollen and round is the ovary. Cut the ovary open with a penknife, and you will see tiny white cells on either side. These are the rudiments of the future seed. The pollen fructifies each seed whilst growing in the ovary and the way in which it is accomplished can with care be traced.

The stamens are filaments bearing on the top single or double caskets, called anthers, full of pollen grains. When the flower first opens, the anthers are closed; but as soon as the air and light have perfected the pistil, it secrets a kind of gum on the surface of its stigma. This is intended to hold fast the pollen-grains. The anthers now open and the golden dust appears, falling on the ready channel, which conveys it to the ovary beneath. The pollen grain itself is not a simple cell, but minute as it is, there are many cells therein, and a subtle fluid, called fovilla, which is in reality the life-giving principle to the ovule. When the pollen-grain falls upon the stigma, it presently opens one of its pores, and sends forth a tube more or less long which descends through the tissues of the style, enters the ovary, reaches a tiny ovule, and pours into it the fovilla, which fovilla forms the embryo or future plant that is preserved and nourished in the seed.

Take a little pollen from the Cucumber plant or Passion flower, and when it is under the microscope; covered with a cover-glass, well lighted and focused, let a drop of

water run in. The moisture is absorbed by the pollen grain, and it throws out a tube and discharges the for villa. It goes off like a little cannon, a cloud of fovilla waving on the slide. To see the actual pollen-tubes in their passage down the style is a more difficult matter; nevertheless it can be done. Use a ¼ inch objective and choose a flower with a stout style, such as the Cistus or Chickweed; the flower must have just faded, when you may be sure the ovules are fructified. With a sharp razor make a very thin section of the pistil, and lift it with a fine sable brush onto a slide in a drop of water, cover, and focus carefully, have a good light, and you will see the pollen tubes actually descending the tissue of the style. We see how varied are the lengths of styles and pistils, yet the pollen-tube stops not until it reaches the ovary, and, when there, it seeks the one spot in each ovule by which alone it can enter, and there, and there only, it rests. Thus we see the all directing power even in the tiniest flower.

The quantity of pollen in a flower is astonishing. The Peony has 174 stamina, each containing 21,000 granules, a total of 3,654,000 pollen-grains. A single dandelion has 243,000 pollen-grains. Although there are so many they are not wasted, as they furnish food for insects.

The pollen-grains can be examined as a transparent object with a drop of water or oil of lemon, and dry as an opaque object. Particularly interesting are the blue pollen of Epilobium; the red pollen of Verbascum, and the black pollen of the Tulip.

The following are of interest: Crocus, Cactus, any of the Cruciferæ, Collomia, Campanula, Cobæa, Scandens, any of Compositæ, Geranium, Daisy, London Pride, Saxifrage, Mallow, Violet, Œnothera, Passion-flower, Lupen, Accacia, Convolvulus, Hollyhock, Primrose, Flax, Musk-plant, Nasturtium, St. Johnswort, Sowthistle, Rush, Crowfoot, Snow-drop, Apple and Lily.

War with the Microbes.

By Dr. E. A. de SCHWEINITZ,

WASHINGTON, D. C.

[Report of an address before the Chemical Society of Washington, D. C., March 9, 1897.]

After a brief history of the discoveries which lead up to the germ theory of disease, the speaker said that Pasteur had done much to throw light upon the origin of these poisons. As the ferment alters the grape juice, so does a microscopic form of life bring about the changes in dead animal and vegetable matter, and also those conditions in the living body which we call disease.

Many of these microscopic forms of single-celled plants, the bacteria, naturally live on dead organic matter, but they also flourish in the living body, unlimited in variety, appearance and behavior. It is possible also to cultivate them upon specially prepared solutions.

The diphtheria germs find their most comfortable habitat upon certain mucous membranes, others in the lungs, some in the digestive tract, still others in the blood, while others again confine themselves to certain external cells and membranes. In artificial culture nearly all thrive upon beef broth. Some prefer the beef broth with an excess of acid, others with an excess of alkali. Some demand the addition of sugar or glycerine, others the addition of both sugar and acid, while some are satisfied with a diet of phosphates, salt and water.

In 1882. Dr. Salmon demonstrated that these poison germs could be used to fortify both man and animals against the attacks of these bacteria. This could be accomplished by introducing into the circulation of the animal a small quantity of the poison of the germ, so that when the germ itself was injected the poison which it produced was without effect. This chemical vaccination was tried for diphtheria, tetanus, anthrax, cholera, typ-

hoid fever, tuberculosis, glanders and a number of other diseases.

This led to another discovery, more important and far-reaching. Fodor showed that the blood serum of animals made immune to a particular disease by injecting the animal with the poison which the germ formed, had the effect of destroying the germ of the disease. This excited renewed interest in the study of the blood and within a few years it was demonstrated in the Washington laboratories, by Behring, by Roux and others, that this serum from previously immunized animals, not only had the property of conferring immunity upon other animals, but also of checking the disease after it had started, and we know that many thousands of lives have been saved by the anti-toxine serums.

How Serum is Secured.—To prepare these solutions, toxins, such as have already been described, are injected into different animals, preferably horses, and at the end of six to twelve weeks the blood of these animals is found to yield a serum containing substances possessing the immunizing and curative properties which we call anti-toxins. The active principle of this serum is comparatively small in quantity, but its influence is enormous.

Recent investigations have shown that these anti-toxic serums can be used for protection against not only tetanus and diphtheria but also for typhoid fever, cholera, anthrax, the plague and others. These serums can be used also by farmers in cases of cholera in hogs and of tuberculosis in cattle and to check these diseases in small animals.

In the case of the venom of serpents, it is found that repeated injections will make the serum of an animal anti-toxic and curative against other venoms. The anti-toxic serum produced by the cobra venom will protect against the bite of the rattle-snake.

When milk and cream are first collected they are al-

most free from germs, but, exposed to the air, they soon become filled with germs perfectly harmless. Under suitable conditions these multiply rapidly and the milk becomes sour, due to fermentation.

If the germs present give an ether or ester which has a pleasant flavor, good butter results; but if they give rise to the formation of disagreable ethers and esters the butter is poor. By isolating different germs and cultivating those giving a good butter, then pasteurizing the cream and afterward inoculating it with the good culture, butter of the same flavor and aroma can always be obtained.

The flavor of many luscious fruits and foods is due either directly or indirectly to one or more of these useful plant cells. There are many ways in which the dreaded bacteria are of use to mankind.

Some Figures Regarding the Blood Corpuscles.

By T. O. REYNOLDS, M. D.

KINGSTON, N. H.

There are so very many things otherwise unknowable which the little instrument helps us to know well, which would forever be in the realm of "the infinite" were it not for that tiny bit of convex glass, that nothing should surprise us in its revelations.

Take, for example, the red corpuscles of the human blood. One thirty-two hundredth of an inch is its diameter. One hundred and twenty one-thousandths of the entire blood quantity is red corpuscles. They are individually so minute that it requires a microscope of considerable power to see them at all; and yet their number is such in one man that if a chain were made of them, each corpuscle just touching its neighbor, it would be over two thousand miles long!

Three gallons of blood in a man of 140 pounds weight

is a fair average, and 0.381 of a gallon of the above is red globules. One cubic inch of these corpuscles made into a chain of a single corpuscle's breadth would be 3,200x 3,200 inches long, or 1,600,000 inches. As there are 231 cubic inches in a gallon 0.381 of 231 would give the cubic measure of red globules in the above man. Thus 1,600,-000x88 gives 140,800,000 inches. Reduced to miles, this equals, counting 63,360 inches to the mile, two thousand two hundred and twenty-two miles! The little invisible red corpuscles or oxygen carriers of our blood would then, if "hitched" together into a chain reach two-thirds across the American continent! A single hair from one's head would make in calibre very many fibres as large.

And yet, small as these corpuscles are, they are giants when compared with many well known individuals of the bacterial world. Think of a body which has to be magnified eight hundred diameters to be visible at all. You have here some of the monococci. Yes, and these inconcivably small bodies are endowed with life, organization and means of propagation.

What Can the Microscopist Find to Study in Winter?

By E. E. MASTERMANN,

NEW LONDON, OHIO.

The study and examination of animal tissues, which are almost always at hand, can be pursued in winter as well as at any other time.

There is no winter, in this section, but occasionally it "thaws" when plenty of material can be obtained in ponds, ditches, creeks and rivers. Indeed one will find specimens in winter not obtainable at any other time of year.

If one really cares for his work and is in earnest about it, he will have the forethought to provide sufficient quantity of material gathered and preserved for winter

use, for at that time it may be supposed to be difficult to obtain any thing interesting or useful.

To the amateur, or even professional, I suggest that plenty of material be gathered during the warmer months. Collect a goodly quantity of insects, seeds, spores of ferns, lichens, fungi, pollens, leaves having beautiful scales, fresh water sponges, etc. If one can, it is agreeable to have material to exchange.

I find it convenient to keep materials of the same kind, in several bottles or jars, so, if one be damaged or broken I am sure of having some left.

One will find it interesting to study the different kinds of leaves, wood, sections of plants, bone, teeth, stone, etc. These, as others, require time to prepare, but what of that.

Preparations and preservatives can be found in books, journals, etc., of which every microscopist should have a representative number for study and reference.

I find a good hardener of flesh and plants to be formalin and distilled water. I use from 3 to 10 per cent formalin according to size of specimen.

For the study of the brain, I use—Formalin 5 per cent (volume), distilled water 90 per cent (volume), bicromate of potash 5 per cent (weight). This is only the average; the smaller the brain, the less formalin I use. I let the brain remain in this solution 4 to 8 days and then place in 10 per cent formalin, 25 per cent alcohol, distilled water 65 per cent.

One must exercise a little judgment, and keep the fingers out of the solution. Keep the formalin in rather a cool place in a glass stoppered bottle. See that jars containing specimens have glass covers and fit tightly.

Library students in Paris wear "muzzles" when perusing old books in the national library, "not because there is fear that they will bite the old volumes, but to prevent the inhalation of the book microbes into their lungs."

Injections of Ass's Serum in Malignant Disease.

ARLOING and COURMONT report (*Bull de l' Acad. de Med.*) the results of a number of experiments on the therapeutic effect of injections of ass's serum, normal or previously inoculated with epithelioma juice, in patients suffering from malignant tumors. Their conclusions may be given in their own words: (1) Injections of ass's serum; previously inoculated with epithelioma juice made in the human subject in the neighborhood of malignant tumors, or even of preventing their generalization and the fatal issue of the disease. (2) They may, nevertheless, be useful by inducing a momentary diminution in the size of the tumors, probably by a regression of the peripheral inflamatory zone. This action may be the starting point of a cure by rendering operable a tumor which was inoperable before the injections. Most frequently it will cause a monentary disappearance of the symptons of compression—pains, edema. The general evolution of the disease will some times be checked for several weeks. (3) Ass's serum so prepared has seemed to us to contain toxic substances which do not exist in equal quantity in normal ass's serum. These substances accumulate in the organism or predispose it in such a manner that at a given moment they produce (at least in cancerous subjects) reaction symptoms (edema, purpura, various eruptions, etc.), about the site of puncture, or even at a distance. These symptoms appear on an average after the fifth injection, and at an interval of time nearer to the puncture in proportion to the time that has elapsed since the beginning of treatment; they disappear at the end of some hours or some days. They are frequently accompanied by constitutional symptons (elevation of temperature, anorexia, insomnia, etc.). About the fifteenth injection the patients refuse to go on with the treatment. (4) With normal ass's serum we have obtained the same shrinkage of

the tumors without ever noticing reactive phenomena comparable to the preceeding (at the seat of injection). (5) Consequently we think that one may try subcutaneous injections of serum in the vicinity of inoperable tumors when these might become operable after changes in the neighboring parts, or when they are accompanied by pain or edema due to compression. Normal ass's serum will be employed in preference to ass's serum previously inocculated with epithelioma juice. At the recent meeting of the Societe de Dermatologie et de Syphilographie, Augagneur (*Sem. Med.*) reported the results of some experiments of the same kind made by him in cases of cancer and syphilis. In patients suffering from epithelioma of the skin he injected ass's serum in doses of 8, 10, and 12 cm. After the injection the tumor became turgid and bleeding, then after a time it diminished in size; this effect was, however, only temporary. He observed similar local phenomena after injections of serum in patients with simple vegetations. The injections have the same effect in persons suffering from lupus; after a peroid of œdema and congestion there ensues a passing shrinkage. Formerly he tried the injections in syphilitic subjects. He made particular mention of one case of exuberant facial and lingual syphiloma, which has improved for a month. He makes the injections into the cellular tissue. Urticaria often occurs about the site of puncture, and there is some rise of temperature. On two occasions albuminuria occurred.—*British Medical Journal.*

Flies and Infection.—Even hash is liable to get flies not only onto but into it. Dr. G. M. Sternberg, Surgeon General United States Army, spoke at the last meeting of the American Public Health Association at Buffalo, N, Y., on contamination of food by flies, and said that it was by no means an infrequent cause of the spread of disease. Diphtheria, cholera, and other germ diseases, he said, could very often be traced directly to flies.

EDITORIAL.

Practical Science.—We are indebted to the bacteriologists for many things, but they have taught us nothing of more practical value than the lesson that a large number of our minor complaints and a thousand-and-one of our aches and pains, which make life miserable, come from auto-intoxication. The ever-present germs in the alimentary tract manufacture their toxines, and these are absorbed much to the distress, if not to the actual danger, of the individual. The good old-fashioned theory that you must "keep the bowels open" if you wish to enjoy perfect health, thus finds a scientific explanation in these latter days, It is now simply a question of common sense: keep the alimentary canal free from the poisons of germ life.

Bacteria Index.—That bacteria may live and grow in melting ice has been shown by Foster. Putrefactive bacteria once gaining access to the household refrigerator live and contaminate meat, butter, milk and other foods kept therein. Wash and scald refrigerators often. A butcher's refrigerator may become so contaminated as to taint his meats and lose him customers.

PRACTICAL SUGGESTIONS.

By L. A. WILLSON.

CLEVELAND, OHIO.

Sealing Glycerine Jelly Mounts.—Before ringing glycerine jelly mounts they should be sealed. Marine glue is a good medium for such sealing. After sealing, a ring of Brunswick Black or White zinc may be run around the preparation and then the slide will be substantially permanent.

A Dead Black Surface on Brass.—To 2 grains of lamp black in a saucer, add a little gold size and thoroughly mix. Just enough gold size should be used to hold the lamp black together. Dip a lead pencil into the gold size and with-

draw and about the right quantity will be obtained; add drop by drop at a time. After the lamp black and size are thoroughly mixed and worked add twenty-four drops of turpentine and again mix and work.

Apply the mixture with a camel's hair brush and when it is thoroughly dry the articles will have as fine a dead black as they did when they came from the optician's hands.

Frullania asagrayana.—This is a liver moss and is interesting from the fact that the leaves are marked by a central moniliform row of cells is often red or scarlet while the leaves are bright green. It is a pretty and interesting sight which is also common to Frullania tamarisci and F. fragifollia. A description of these interesting plants may be found in the revised edition of Gray's lessons and Manual of Botany page 706 (1887). These plants are easily found, almost ubiquitous and always pretty objects. They seem to keep and mount well in glycerine jelly, though they are very fine when kept in a cabinet and examined in water when desired.

A Mounting Medium for Desmids.—It is said that the following is a good mounting medium for desmids.

Carbolated mucilage of gum arabic and a solution of borax. Mix in a watch glass. Put a drop on the desmids, cover and ring.

How to Harden Balsam Mounts.—After mounting, heat the balsam. Nearly all the specimens can be mounted in warm balsam, without fear of injury, and then as soon as the balsam becomes cool, it is firm and hard.

Disinfection of Mails from Plague Districts.—The Pensylvania State board suggests to the Post-master General, in view of the fact that the plague is a germ disease, the importance of taking the necessary steps to insure the disinfection of all mails coming from districts in which the disease may prevail.

QUESTIONS ANSWERED.

NOTE.—*Dr. S. G. Shanks, of Albany, N. Y., kindly consents to receive all sorts of questions relating to microscopy, whether asked by professionals or amateurs. Persons of all grades of experience, from the beginner upward, are welcome to the benefits of this department. The questions are numbered for future reference.*

247. *Q.*—Please give the best method of preparing, staining and mounting spermatozoa and oblige.—Investigator.

A. Smear a cover glass with the spermatic fluid, let it dry and stain with eosine. Or use Unger's fluid: Methyl green, 10 grains; water, 1 oz; Hydrochloric acid, 1 drop: mix. This method will stain the spermatozoa in three shades of green.

Ehrlich–Biondi fluid (blood-stain) will stain spermatozoa beautifully. Let the prepared cover remain in the stain for 24 hours. After staining in any of the above solutions, wash quickly in water and dry. Mount in xylol balsam.

248. *Q.*—Price of Practical Hints, etc., on the Microscope by John Phin. General description, pages, etc., date of last edition.—R. H. D.

A. Last edition, 1890, price $1.00, postage 8 cents, cloth 231, pp. The book is intended for beginners. It contains descriptions of microscopical apparatus and accessories with directions for their use, also some general hints on collecting and mounting objects, with formulæ for mounting media and cements. It is practical as far as it goes into the subject.

SCIENCE-GOSSIP.

Rapid Filtration.—C. W. Shackett in the Druggist's Circular gives a description of a contrivance to aid in filtration which he devised and which he finds very useful in practice. The usual metal filter racks proving unsatisfactory to him in many cases, he procured some glass stiring rods about 3–16 of an inch in diameter, and from 5 to 8 inches long, one end being bent to form a small hook.

These being hung inside a funnel form a corrugated filter support which is unaffected by liquids likely to be filtered through a glass funnel, and can be thoroughly cleansed with a minimum of labor.

The Medical Inspection of Schools.—The Health department of New York City has become convinced that one of the greatest sources of the spread of contagious and infectious diseases among children is through contact with each other in the schools, and has asked for an appropriation for a medical inspector in all the schools in the city, public, private and parochial.

There are certain practices which now exist, such as drinking from the same cup and using the same towel, which should be prohibited. It is strange that any intelligent educator should allow such practices. Another thing which otherwise good instructors do, is to allow their pupils to sit in close unventilated rooms. It has been proven by experiment that scholars of moderate ability who use class-rooms well ventilated will at the end of the term surpass much brighter scholars who have been kept in unventilated rooms.

Counting Blood Corpuscles.—Dr . Judson Deland, of Philadelphia has invented an instrument for counting blood corpuscle. It works on the centrifugal force principal, and accomplishes the measurement by means of comparative bulks. A quantity of blood is placed in a finely graduated tube and the latter revolved at a speed of about 1,000 revolutions a minute. The corpuscles divide by force of gravity, and form on the side of the tube in easily traceable divisions of red corpuscles, white corpuscles, and serum. The new method permits of larger, and consequently more representative quantitatives being used in experimenting, besides doing away with actual microscopic counting.

Pimply Potatoes.—A peculiar condition of potato tubers commonly known as "pimply" potatoes has been for some years past a quite serious drawback to the potato industry in some sections of the State. The cause of these pecu-

liar, unsightly pimples and silver-like projections on the surface of the otherwise apparently healthy potatoes has been the subject of much comment and speculation, especially by those potato growers living on Long Island, in which section of the State the disease is prevalent. Recent investigations and experiments on Long Island conducted by the N. Y. Agricultural Experiment Station have brought to light the previously undiscovered facts as to the cause of this disease. It appears that the real cause of this injury is the well-known black cucumber beetle—a small, black, flea-like beetle—which, although commonly called the cucumber beetle, has proven that it is fully as fond of eating holes into the leaves of potato and tomato plants as it is of doing a similar mischief to the cucumber.

But, although the beetles themselves are voracious feeders, they are not the immediate cause of the mischief. The female beetles lay the eggs which produce minute, slender white grubs. These burrow into the tuber and cause the "pimples" and their accompanying "slivers." Thus there are two prominent characteristics of this disease, namely: the "pimples" and the "slivers;" the one is probably the result of the irritation caused by the worm, while the other is a slender canal in which a single grub may feed. An interesting peculiarity in this connection is that the "pimples" may be found on the same tuber without the "slivers" as well as the "slivers" without the "pimples."

Cement for Celluloid.—Celluloid may be firmly attached to wood, tin, etc., by using a cement composed of two parts of shellac, three parts of spirits of camphor, and four parts of strong alcohol. Keep closely corked.

Rabies has increased in England since the law relating to muzzles for dogs was repealed in 1892. There were 38 cases that year. In 1893 there were 93 instances; in 1894, 248, in 1895, 672.

Back Numbers.—We are furnishing the past fifty numbers of this magazine (1893, 1894, 1895 and 1896) complete with four premium slides on receipt of four dollars,

THE MICROSCOPE.

Contents for March, 1897.

THE MICROSCOPE

APRIL, 1897.

NUMBER 52 NEW SERIES

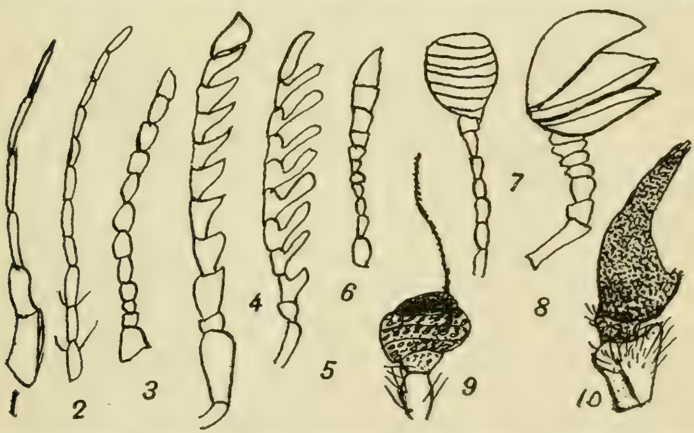
Objects Seen under the Microscope.

BY CHRYSANTHEMUM.

XXXIX.—THE ANTENNÆ OF INSECTS.

These are of many and varied forms, some being long and slender, while others are club-shaped, plumed or of irregular shapes. They are classified by Comstock as follows:

1. Setaceous or bristle-like, in which the segments are



successively smaller and smaller, the whole organ tapering to a point (fig. 1).

2. Filiform or thread-like, in which each segment is of nearly uniform thickness throughout (fig. 2).

3. Moniliform or necklace-form, in which the segments are more or less globose, suggesting strings of beads (fig. 3).

4. Serrate or saw-like, in which the segments are tri-

angular and project like the teeth of a saw. Glow-worm, Fire-fly, and Skip-jack are examples of this class (fig. 4).

5. Pectinate or comb-like, in which the segments have long processes on one side like the teeth of a comb or on both sides like a feather (fig. 5).

6. Clarate or club-shaped, in which the segments become gradually broader and the whole organ assumes the shape of a club as in the Burying Beetle (fig. 6).

7. Capitate or with a head, in which the terminal segment or segments form a large knob (fig. 7).

8. Lamellate, in which the segments that compose the knob are extended on one side into broad plates, e. g. Cockchafer (fig. 8).

These organs are very important in all insects and form distinguishing characters in the genera and species. They are situated on the head near the eyes and deserve particular attention and study. They are very wonderful in their construction and appear to be very useful, for by them insects seem to communicate. Some think they are organs of hearing as well as of feeling and some think insects may possess a sense which we know nothing about.

Look at the head of the common dung beetle, which has clubbed antennæ formed of leaflets, capable of being shut up. The antennæ of the cockchafer, a Lamellicorne beetle, consist of leaflets also, and if soaked in liquid potassæ, then dried between two slides, soaked in turpentine and mounted in Canada balsam, it will show a cellular tissue of oval cells, with nucleus and nucleolus, according to Quekett; but with an external cuticle of hexagonal cells, according to Carpenter. The organs of sensation, sacs and sacculi are found in them. These have been described in our article on the Honey-bee. See November, 1895.

One species of the Ichneumon fly presents singularly-shaped perforations, in which the transparent membrane

over-arches and extends beyond the aperture, and gives it the appearance of an inverted canoe.

The antennæ of Argynnis possess small transparent dots and chambered cavities. Antennæ of the Dragon-fly furnish the most beautiful examples of these acoustic chambers, and display the nerve well.

The antennæ of the Silk-worm show a variation in the sexes, those of the male being pectinated throughout equally, while in the female the branches are shorter and alternate, a short one with a long one.

To secure the female, it is often easier to collect the immature forms, and by putting the newly hatched female in a box having a perforated cover the males will find their way to the house, also through a small opening in the window and often into the box itself in search of a mate. Sometimes three or four males may be secured in this way.

One should look for Branchinus, Calathus, Harpalus, Dytiscus, Elater, Silpha, Earwig, Cockroach, Hawk-moth and Nocterna, of various kinds. Their large plumed antennæ make beautiful objects when mounted dry, and in the smaller insects it is well to mount the head entire with the antennæ in situ.

In addition to the illustrations of the eight classes of antennæ, that of the Tabanus (fig. 9) and of the Soldier-fly (fig. 10) make interesting objects when mounted.

Fungi.—Dr. Jelliffe, in his lecture on mushrooms and toadstools, says that all the fungi are beasts of prey, speaking from a vegetable standpoint. The germs of cholera, typhoid fever, consumption, diphtheria, ring-worm and the disease of fungus food known in India, present types of the fungi that live upon the human body. Yeast lives upon the flour and sugar in the process of bread-making. Moulds live upon bread, cheese, and preserves while the higher fungi (mushrooms) draw their life from decayed animal matter, decayed wood, or manure.

The Hydroids.

By H. J. CLEMENTS.

CHEYENNE, WYO.

As the summer approaches, many of those interested in microscopy will doubtless be among the favored, who can spend a part of their vacation at the seaside, and as one of the easiest obtained and most interesting of the forms among the multiplicity of life there, are the Hydroidea, perhaps a few notes upon them and on some methods of study will not be amiss.

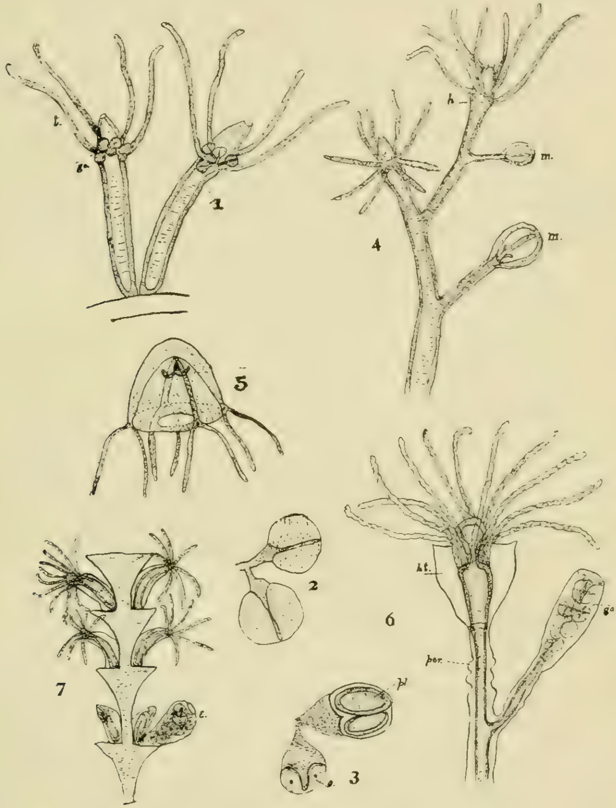
A number of species are to be found on the Fucus or Bladder-wrack which has been stranded at low water. By looking over a number of bunches of this. one can hardly fail to find patches of white or pinkish animal-like material, and if he places these into the water for a moment, he will be rewarded by seeing the many tentacles expand and the beautiful zoophytes resume their accustomed activity.

Other species will be found attached to piers, within easy reach at low water, still others will be found growing to the rocks in the tide-pools.

If the collected hydroids are placed in pails or bottles with clean salt water, taken home and transferred to dessert dishes in which fresh sea water is placed and occasionally changed, the student will have aquaria that will easily interest and instruct him for hours at a time. Care must be taken not to crowd these dishes with too many colonies.

A little observation will make it evident that these remarkable creatures are apparently of three classes, one often having the appearance of that shown in figure 1, and known to zoologists as the Tubularian Hydroids. These are essentially tubes closed at one end, an opening for the injestion of food being at the other end, which is thus spoken of as the mouth. This end is also enlarged

and forms the head, which bears one or more rows of tentacles. Many of the tubularians (fig. 4) form much branched compound colonies, much as a seedling will by



EXPLANATION OF FIGURES.

1. Clava leptostyla,—*t*, tentacles; *go*. gonophores.
2. Male gonophores of above.
3. Female gonophores of above,—*o* unsegmented eggs; *pl*, eggs which have developed into planulæ.
4. Bougainvillea,—*h* feeding hydranths; *m*. medusa buds.
5. Liberated medusa of above.
6. Obelia,—*h t* hydrotheca; *go*. gonangia; *per*, perisarc.
7. Sertularia,—*e*, egg capsule.

repeated budding form a dense bush. Some, however, form the buds near to the attached end and thus the colonies consist of small closely crowded bunches, each individual appearing as if separate.

In addition to making out the general form of the animal, one is apt to find many peculiar short rounded bodies (fig. 1, *go.*) which in some species are grown in grape like clusters. These are the reproductive organs and have an especial interest, because many hydroids have an alternation of generations so that these little bodies are not hydroid eggs as we might suppose, but are minute jelly fish, some of which, if you let the material stand over night, will escape; and if one looks sharply for them they can be seen travelling gracefully to and fro in the water. The accompanying cuts (figs. 4 and 5) represent somewhat their appearance before and after their liberation.

Many forms however, instead of liberating these medusa forms, seem sure enough, to produce eggs and spermatozoa, as we might think the more natural. The medusæ are essentially produced but have through degeneration lost their power of movement. Figures 2 and 3 will indicate the principal difference between these male and female gonophores. Those producing eggs will often be much distorted by the growth of the eggs, for they undergo quite a development before they are liberated. The sperm producing buds are quite characteristic, because of being more or less clear and to a low power homogeneous, with a dark central stalk dividing them into two divisions.

The careful study of the development of the eggs is not hard to carry on, and will more than repay for the time given it. Should it not be desirable to watch the changes in any particular cell, one can by comparing a number of buds, soon get an idea of the entire process

PRESERVATION.—The fixing agents which will best kill the tubularia with tentacles expanded are Perenyis' fluid, picro-sulphuric acid or a saturated solution of corrosive sublimate. They should be quietly but quickly lifted from the water into the killing fluid, allowed to stay in

it for only a short time, rarely as long as five minutes. except in the case of Perenyis, when two hours is better. They are then to be placed into 50 per cent alcohol, which should be changed once or twice, for a few hours; then into 70 per cent for a day; finally into 80 per cent, which seems to be the best strength for final preservation. It is well to change this after a few days.

CAMPANULARIAN HYDROIDS.—These in general form and habitat are like the preceding, differing however in a number of important details. The accompanying figure (6) will serve to show the special differences in structure. It will be noticed at once that these animals are encased by a horny covering, the perisarc, which about the head is bell-shaped, thus the name campanularian.

The method of giving rise to the jelly-fish is characteristic, and occurs in the club-shaped gonotheca (fig. 6. *go.*) which consists essentially of an axis from which the medusæ bud, the whole being protected by a case. Here again we find the degenerated form of retaining the medusa, allowing the egg development to proceed until the planulæ are produced. It is easy, on keeping hydroids during the reproductive season, to find in the water either those dainty little swimming jelly-fishes, or the white worm-like planula. The latter when examined with the microscope, are seen to be a little solid cellular mass, consisting of two kind of cells, an outer layer forming the ectoderm, the inner consisting of the endodermal cells, which as development proceeds separate, forming a central cavity which, by and by becomes the stomach. The outer surface of the ectodermal cells is richly provided with cilia, by which the animal moves. The complete development into the adult hydroid is easily studied and occupies but a few days.

PRESERVATION.—The method outlined for the tubularians, will preserve these excellently for histological

study, but rarely will they be, when thus killed, expanded; for they are exceedingly quick to move when disturbed. By boiling the fluids and quickly dropping in the colonies, fairly good results are possible, but in time the tissues tend to break down, so it cannot be relied on for indefinite preservation.

The best method of all, when the only object is to kill the colonies with hydranths naturally extended, is to slowly add crystals of epsom salts to the water in which they are living. It is best to take small colonies in a watch glass for this. The salt narcotizes them, and if they are then placed in a 5 per cent solution of formalin, they make beautiful specimens, especially if stained with an aqueous stain and mounted in glycerine jelly.

The sertularian and planularian hydroids (fig. 7), are generally classed with the preceding group, but as they will strike the beginner as being so distinctive, I briefly speak of them here. Like the Campanularia they are covered with a case, which here reaches its highest development, and with it the zooids are the most nervous. They are easily recognized as those delicate, white, wiry masses sometimes mistaken for sea-weed. They are usually found in great abundance on the Fucus between tide-marks. In the early summer, the egg-cases form a very prominent feature. It is extremely difficult to kill them expanded, but the last method suggested, will often succeed in giving beautiful specimens.

Iowa Plants.—Professor L. H. Pammel has distributed his first fascile of Iowa Plants. The others will be distributed as soon as the material is ready.

Diseased Pork.—A French periodical reports fifty people killed in an epidemic from eating pork affected by the specific bacillus of the pneumo-enteritis of pigs. Hog cholera had prevailed : One man had sold fifty-seven pigs of which forty-one had died of the disease.

Three Drops of Water.

By T. O. REYNOLDS, M. D.

KINGSTON, N. H.

It is, always has been, and may always be a popular notion that, if submitted to microscopical examination any drop of water teems with animal life and in truth is a little cosmos of itself. Now, the fact is that pure water contains nothing discoverable under the most powerful instruments ever yet made. What then is the cause for this floating idea among the better informed people?

Is it the "fakirs" who infest our fair-grounds and commons with their "powerful microscopes" magnifying twenty five or forty diameters (!), with a previously prepared drop of water (pure, 10 cents a peep), and the crude notions of some of our newspaper people, school teachers, and clergymen? Probably.

Now let us get down to the real; have no ten cents about it. Step in and look with a good microscope. What do we find?

1. In pure water nothing whatever.

2. In water coming from stagnant pools or still coves of ponds or lakes where dead or decaying vegetable matter is abundant, hundreds of animals. The dazzling, delightful rotifer; the skipping paramecium; the grotesque daphnæ; mixed with probably hundreds of little chaps the names of which are altogether too long for their size and importance in the animal world.

3. Now, there is another drop of water commanding our attention, of perhaps more real vital importance than the former two. It is that water which contains bacteria. A drop of water may appear pure, and even under ordinary powers of magnification seem pure; yet, under a good 1-10 or 1-12 inch objective, it may show typhoid fever germs, *et cetera*, which render the said water in all

senses unfit for drinking and very dangerous. Wells and streams may get contaminated that way if sewage gets into them.

We have then three drops of water; three specimens: one pure and potable, another filled with animalculæ and a third infected with disease germs, the most dangerous of all. The animalculic water is not dangerous to health though not so very desirable for drinking purposes. We are here reminded of the lady who on being warned to boil her drinking water before partaking of it remarked that she had rather be an aquarium than a cemetery; meaning that she had rather contain living than dead bacteriæ. She little knew the difference to her health. Dead bacteriæ are harmless; living ones far from it. Look out!

EDITORIAL.

Wood Pavements the Home of Microbes.—The laying of these pavements in this country and their extensive use abroad has led to an investigation of them as a lodging place for bacteria.

It has been demonstrated by two French physicians that the number of microbic elements in the superfical layers, after the surface has been washed with water, amounted in one instance to 50,000,000 and in another to 79,360,000 per gram (15 grains) while at the depth of 5 centimeters, (2 inches), in one case they amounted to 50,000 per gram; and at a depth of 6 centimeters in the other case to 423,600 per gram. Only a small portion of these microbes were liquifying organisms, and they caused no infection when injected into guinea pigs. The point which is of the most importance from a hygienic point of view, is that the microbic infection is not a surface affair; it cannot be washed off.

The bacteria are in the wood to the depth of two inches in considerable quantities and the wear of the pavements exposes them constantly. Although they of themselves

may be quite harmless, when united with others they might become epidemic, and although it is not proven that they are disseminators of disease yet they must be regarded with suspicion.

Cerium Nitrate as a Bactericide.—It is stated that in proportion of one part to a thousand, cerium nitrate is a powerful bactericide and it is proposed to introduce it into therapeutics.

Infection.—Never wet a lead pencil with the tongue or lips as it may have been in the mouth of some one else previously or may have otherwise collected microbes.

How to Preserve Rotifers.—The rotifers can be preserved with their wheels and other appendages extended according to M. Nicolas de Zograf, by narcotizing with cocaine hydrochloride, treating with osmic acid, then with weak crude wood vinegar, washed with water and dried by alcohol.

PRACTICAL SUGGESTIONS.

By L. A. WILLSON,

CLEVELAND, OHIO.

Fissidens taxifolius.—This is one of our smallest mosses. The plants are two or three centimeters long. A sprig mounted beneath a 5-8 cover is a very pretty object. They must be mounted while moist for as soon as they are dry they begin to shrivel. Taken from water and placed in glycerine or glycerine jelly the ends and margins of the leaves curl up almost instantly. They would probably show to best advantage if moistened, spread out, then pressed until quite dry and mounted in balsam. It is a novelty to see such small but beautiful and perfect leaves.

A Home Made Eye-Piece Micrometer.—Beyond all doubt, a micrometer purchased from a reputable dealer is the best. However, many beginners would like to experiment in micrometry before they are prepared to make a purchase. To effect the object, remove the field lens of

the ocular and apply a very little stiff balsam to the underside of the diaphragm at two opposite points. Ravel out a very fine straight fibre of silk.

Attach the fibres across the diaphragm and fasten to the balsam; then attach another fibre parallel to the first. You will then have a good means of comparing the relative sizes of objects and by obtaining the distance value of the threads with a stage micrometer a valuable and accurate eye-piece micrometer may be obtained.

Cleaning Diatoms.—The following is quoted from an old journal. Free the diatoms from water, as far as possible, by decanting. Then cover with a liberal quantity of pure concentrated sulphuric acid. Then heat to boiling in a procelain evaporating dish, continue the heating until the white fumes of sulphuric acid begin to escape freely. Then while still boiling add saltpeter in bits the size of a pea and wait, after each addition, till the effervescense ceases before adding more; continue until the whole mass is white or light yellow. This will not usually consume more than five minutes. Then wash the cleaned diatoms with successive portions of distilled water as usual.

The Heat Process.--Many frail organisms with cilia or tentacles may be prepared for mounting with the cilia or tentacles expanded in the following manner: Have in readiness a slide with a well dried cell. Place the animals, to be mounted, while alive in a drop of water on the end of a plain slide. See that the cilia or tentacles are expanded. Then quickly hold the slide with the animals over a student's lamp from three to five seconds; remove and place the slide upon a good heat conductor until cool; when cool pour the drops containing the object into the prepared cell; under a dissecting 'scope, arrange the animals and fill the cell with a preservative fluid, then cover and finish. Chloral hydrate, glycerine and glycerine jelly will be found to be good preservative fluids. Remember that the cilia and tentacles will be destroyed by the least rough handling. A camel's hair brush, delicately used, will be found most servicable in arranging the objects.

QUESTIONS ANSWERED.

Note.—Dr. S. G. Shanks, of Albany, N. Y., kindly consents to receive all sorts of questions relating to microscopy, whether asked by professionals or amateurs. Persons of all grades of experience, from the beginner upward, are welcome to the benefits of this department. The questions are numbered for future reference.

Q. 249 Where can the following books be had? 1. Microscopists' Annual, referred to in Phin's Practical Hints. 2. John Mayall's Cantor Lectures. 3. Andrew Ross, The Microscope. 4. Thos. Dick. The Telescope and Microscope.—H. L. W.

A. Mayall costs ninety-five cents in paper. Ross costs seventy-five cents in cloth. Dick costs fifty cents in boards. All may be ordered from Bausch and Lomb Optical Co., or from Philadelphia firms.

The Telescope and Microscope, by Dick, is antiquated and not worth buying at this date.

The International Scientist's Directory, by S. E. Cassino, Publishers, Boston, Mass., Paper, $2.00, will give foreign addresses of scientists and of some dealers.

SCIENCE-GOSSIP.

Illusions of the Microscope.—While observing the great commotion in the medical world following the announcement of Dr. Koch's discovery—commotion which may be likened to that produced by throwing a stone into a frog-pond—we note that physicians are divided into two camps, that of the Kochites and that of the anti-Kochites. For our own part we remain in the gallery a quiet observer, taking account of the phenomena as they develop.

The end of it all is apparent enough : There will be a return to vitalism, or, if you will, to the Hippocratism of ancient days, the school of which dosimetry is an humble but convinced successor. Vainly do the laboratories endeavor to invade clinical medicine with their artificial, synthetical products. The medical world will finally employ the alkaloids, the incitants of physiological changes,

and the regulators of movements which have became morbid.

Well, the reports of Dr. Koch will have the termination of these tentatives concerning the bacillus. Will the matter finally result in a summing up similar to that given in relation to the floating sticks of the fable?

"From afar it appeared to be something; near at hand it was—nothing."

Certainly science is a grand thing, but we must guard ourselves against such illusions of the microscope as prevent us from having a clear view of things.

Speaking of illusions we recall Raspail's little affair with the Paris Academy of Sciences. This learned botanist was unfortunately an intransigeant in politics. Anonymously of course, he sent in a thesis on the micrography of plants, in competing for the prize of the academy. Well, the prize (10,000 francs) was awarded for Raspail's article.

But when the committee on prizes learned who the author was, they retained the prize and communicated with the Government, who decided that Raspail could not have it.

So Raspail waited awhile and concocted a plan of revenge. He announced finally to the Academy of Sciences, that he had discovered the insect while causes psoriasis, and was about to demonstrate before the academy the truth of his discovery. He took a psoriasis patient with him to the academy meeting, and, before the assembled scientists pretended to remove the insect on the point of a needle, from the patient's skin. In reality, he took upon the point of a needle a minute quantity of fermented cheese which he had concealed under his thumb-nail. The academicians crowded around him during this brilliant demonstration, and great was their astonishment when they observed the wriggling worms in the field of the microscope. Well, the Academy published a brilliant account of this proceeding, and, on the following day, Raspail published his own account in which he stated that what the academicians so readily took to be the microbes of psoriasis were in reality, the *worms of cheese.*—Dosimetric Medical Review.

A Microbe-Proof House.—One of the oldest domiciles on earth is that recently erected at Yokohama by Dr. Van der Heyden, the noted bacteriologist of Japan. The New York Home Journal describes it as a dust proof, air-proof, microbe-proof building of glass, which stands on the open, unshaded grounds of the hospital of Yokohama. The house is 44 ft long, 23 ft. wide, and 17 ft. high. Large panes of glass, ½ in. thick and about 4 in. apart, are set in iron frames, so as to form the sides of a cellular building block. Of these blocks the walls are constructed. There are no window-sashes, the air escape being through several small openings around the upper part of the second story, but through which no air from the outside is admitted. The air-supply is obtained from a considerable distance, forced through a pipe, and carefully filtered through cotton-wool to cleanse it of bacteria. To insure further sterilization, the air is driven against a glycerine-coated plate glass, which captures all the microbes the wool spares. The few microbes brought into the house in the clothes of the vistors soon die in the warm sunlight with which the place is flooded. The space between the glasses of the building-blocks is filled with a solution of salts which absorbs the heat of the sun, so that the rooms of this house are much cooler than those protected by the thickest shades. In the evening the interior is heated by the salts radiating the heat they absorbed during the day. So effective is the system of regulating the temperature that a few hours of sunlight, even in freezing weather, will render the house habitable. It is only when several cloudy days follow in succession that artificial heat is needed. Then it is supplied by pumping in hot air.

Education.—"Does Modern College Education Educate, in the Broadest and Most Liberal Sense of the Term?" is one of the most important inquiries that could be set on foot. This discussion, which is to be taken part in by President Gilman of the Johns Hopkins, President Dwight of Yale, President Schurman of Cornell, President Morton of the Stevens Institute, Henry Thurston Peck of Columbia, Bishop Potter and others of the most distinguished men of both the United States and Europe is begun in the April Cosmopolitan by a radical inquiry into the educational problem along the lines of Herbert Spencer.

THE MICROSCOPE.

Contents for April, 1897.

THE MICROSCOPE

MAY, 1897.

NUMBER 53 NEW SERIES

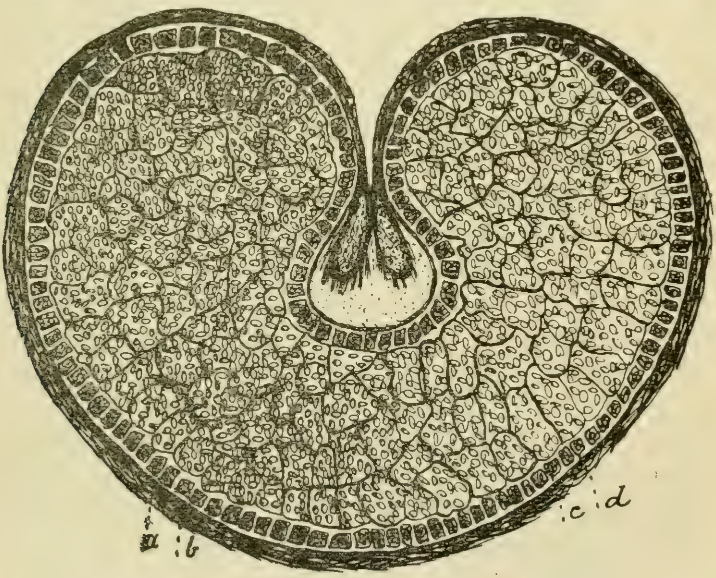
Cutting and Mounting Sections of Cereal Grains and Starchy Tubes.

BY J. D. HYATT,

NEW YORK CITY.

[Abstract of an article read before the New York Microscopical Society, Feb. 19, 1897.]

During the twenty years of my membership in this society, The American Microscopical Society, and the



Postal Club, I have never yet seen, on exhibition, a section of wheat or other grain. It seems a little remarkable that a microscopical study of such great economic importance as that of the cereal grains should be omitted.

The principal motive I have in presenting these sections is to illustrate the educational value of the microscope in our public schools. Dr. Julien in his interesting address on "Microscopy in the Scheme of Education," has advocated in very forcible terms the value of the microscope in arresting the attention, and developing the observing and reflecting faculties of children. While formerly it might have been an inovation to introduce the microscope into the public schools, now such a step might even be regarded with favor.

Recently manual training has been introduced into the schools for boys; sewing and cooking for the girls. Under the subject of cookery the teacher was required to teach the nutritive value of different foods and to explain the "Germ Theory and the Causes of Decay and Decomposition in Organic Bodies." By what process of instruction they were expected to develope in the minds of pupils, from twelve to fourteen years of age, clear ideas of these subjects without the use of the microscope which is not on the list of school supplies, is incomprehensible.

While visiting the cooking teachers' class one day, the teacher was explaining the relative nutritive value of the various kinds of flour, dependent upon the different processes in milling the wheat. While her explanation was sufficiently lucid, it was difficult to convey her meaning to the minds of these city girls, who perhaps had never seen a kernel of wheat and probably knew nothing of the process of making the flour. In this instance the pupils showed listlessness and wandering thought. The teacher turning to me asked if I could furnish a section of the kernel of wheat, which when placed under the microscope might facilitate a proper understanding of the subject.

This I agreed to do but found it difficult to properly mount a specimen without the starch escaping and clouding it. After a trial of four or five days it was found that sections could be prepared after slightly softening

the kernels by immersion in water. If too soft the starch will fall out. If too hard they will crumble. Indian corn may be kept moist twenty-four hours; wheat four or five hours; rye five or six; barley ten or twelve; and oats not more than one or two hours. The difference is according to the thickness or hardness of the epidermis. The imbedding may be done in any convenient manner as the cutting is easily done after the grain is softened. They should be cut very thin. Glycerine jelly is the best medium for mounting. This must be softened to the requisite degree of fluidity by placing it in a cup of warm water. The sections are best removed from the knife with a camel's hair pencil. If they are deposited in a shallow dish of water they may be taken up with the pencil as wanted and placed upon the slide, the center of which should be marked with a dot of ink. If the slide is inclined, a drop of water placed above the section will run down and carry away nearly all the surrounding grains of starch. If any starch remains it may be removed with a small brush.

While holding the brush in a horizontal position, take a cover in the forceps, warm it slightly over the spirit lamp, and holding its exact center over the section lower it carefully upon the gelatine. If this is carefully done the cover will settle down to its place without disturbing the starch cells. Any attempt to move the cover or press down upon it will cause a cloud of starch to issue from the cells. Should the gelatine become hardened a little, allow it to become quite hard; then place on it a weight and warm the slide gently over a spirit lamp. Wheat and oats are more difficult to mount than the other cereals.

In the illustration the extreme outer coat (a) is the epiderm or husk, and constitutes what in milling is called the loan. It consists largely of cellulose, and contains no important nutritious element. The next layer (b), quiet thin, contains some oil and albumen. The rec-

tangular symmetrically arranged layers of cells (c) are filled with gluten. The entire interior (d) is filled with cells of irregular shape containing starch, and it is of this that the finest wheat flour is made. The gluten cells are excluded in the milling because they are of a darker color, but chemical analysis shows that the "whole wheat" flour is more nutritious and wholesome although darker in color.

Enclosures.

By W. S. BEEKMAN,

WEST MEDFORD, MASS.

Calcite is one of the most fantastic minerals we have in our cabinets. We find it in every conceivable style, color, and aggregation. Its chemical composition may remain constant, and its crystals may be assigned to two systems; yet its magical power of assuming states of endless variety of combination of the two; and magnificent aggregations belonging to neither crystalline nor amorphous, is amazing. The magnificent unfoldings of Flos-ferri peculiar to certain districts; the metamorphic action distorting it in others; the comb-like crystalline forms in other places, afford many fine specimens.

For the microscope, however, but few varieties in their natural state, offer much that can be considered advantageous for study. To be sure, the fragments which occur on breaking up certain English specimens, whose minute crystals are bedecked with a profuse sprinkling of irridescent pyrite, are well-known among exquisite opaque mounts. The study of the mineral inclusions is an interesting one, and in calcites from the famous Joplin finds, whose finest golden crystal weighed one hundred pounds we occasionally find an inclusion that is very interesting. It is to be noticed in certain specimens of these transparent calcites, capable of showing double-refraction, that the molecular forces have arranged a series of marcasites

in a peculiar manner, at right angle to the edges of the rhomb. I have saved a number of these little rhombs, and suggest mounting two slides: one as it is, perhaps thinned down; and another just etched off with acid, to show the marcasites in relief. Any one sending me a stamped envelope will receive a sample.

Vegetable Sections.

BY PROF. F. D. KELSEY,

OBERLIN, OHIO.

Many vegetable sections prove stubborn in retaining stains during the dehydrating process in alcohol, and lose still more in the clearing with clove oil or with Gage's fluid. This is especially true of tissues where it has been necessary to remove starch by potassium hydrate or nitric acid. What shall be done? Excellent results have been obtained by the present writer in the following manner:

After the killing of the sections, or the clearing of starch, dehydrate thoroughly, and stain, not with the stains as usually prepared, but with staines *dissolved in clove oil itself*. After staining, clear in a separate drop of pure clove oil, or Gage's fluid, and mount as usual in balsam. Specimens so stained appear to be as "permanent" as any other eosin specimens stained in the ordinary manner, and have a depth and richness of color not attained by the ordinary way. Any worker in vegetable sections knows how often vexatious results are reached by stains not taking. This clove-oil-stain method has not yet failed to reach satisfactory and beautiful results in the hand of the author. Of course dehydration must first be perfect before the section is put into the clove oil stain. In mixing up clove oil stain, care must be taken to use the powdered stains and not get the solution saturated. A dilute clove oil stain is better than a concentrated one.

Preparation of Insects and their Parts.

By J. TEMPERE,

PARIS, FRANCE.

[Translated from Le Micrographe Preparateur.]

Whole Insects.—The preparation of a whole insect is not very difficult, but it requires knowledge, patience and care. The time of immersion in potash varies, not only in the different genera, but also in the species; in certain of the spiders, for example, the immersion ought to be prolonged not more than five or six hours. It is the same in some of the small orthoptera, while for other species in both of these genera twenty-four to thirty-six hours are necessary. If we take insects from the class Coleoptera, the time and the difficulties increase with the thickness of the chitine, and the time will then vary from eight to forty days, and it is even more for the larger species. It thus becomes necessary for the operator to follow daily and attentively the action of the potash, and it is only when the insect has become clear, and when certain parts, as the head for example, commence to allow the light to be seen through them that it is time to take them out of the alcoline bath and to prepare them without delay before they separate.

In general, when taken from the bath, the insects are sufficiently soft and their parts more readily broken so that it is necessary to move them with great care in a saucer or a little curved plate half filled with distilled water. Place the insect upon its back and arrange the legs in as natural a position as possible on either side of the body, using fine pincers and a mounting needle. Then arrange the antennæ, the palpi and the principal pieces of the cheeks in their places. That done, place the end of the middle finger of the right hand upon the thorax, that is to say, between the pairs of legs, and press lightly towards the abdomen.

Nine times out of ten if the insect is in the right condition, that is, has remained the right length of time in the potash, the contents of the abdomen which has been reduced by its action, begin to flow out through the anal orifice in the form of a brownish semi-liquid, and which disengages itself immediately when water is applied. In the proportion that the abdomen empties itself increase the pressure towards the extremity. If there is a resistance it proves that one of the internal parts, probably the stomach, has been imperfectly dissolved and obstructed the anus, thus preventing the discharge. In that case take a needle more or less fine according to the size of the insect and while continuing the pressure with the right hand, with the left carefully introduce the needle into the orifice, which, thus opened and enlarged will allow the remainder to pass out.

The abdomen being very nearly empty, we will proceed to the head; there it is very necessary to have the pressure light and sure, for the work must be done with great precaution lest the delicate pieces of the cheeks be misplaced or torn.

The head being empty, hold the insect with the finger, while you take away the first water and replace it by another, in which, repeat the same process as before, adding the pressure of the legs, which should be from the tarsus towards the thorax.

This operation ought to be repeated several times until there is not a particle of matter remaining in the interior of the subject. Then replace the distilled water by water to which has been added a small quantity of acetic acid. Now allow the insect to float upon a slide and after having expelled all the water arrange the different parts as naturally as possible, cover with a second slide, which should be secured to the first by a thread, giving as much pressure as possible. Then place the whole in a bottle of 90 per cent alcohol for twelve hours.

It is well to change this alcohol at least once during this time. On taking the slides from the alcohol detach them, leaving the insect adhering to one of them. It must now be raised with caution seizing it with a pair of fine pincers upon the thorax and placing it in absolute alcohol for from four to six hours. Then place it in essence of lavender, where it ought to remain the same length of time, if it is sufficiently clear, as it will become spotted if it remains longer. The mounting is made in very thick balsam and it is thinned by being placed in water and heated gradually to 100°. Place the insect on a slide when it is taken from the lavender, drop onto it some balsam, a little more than is needed, place over it a cover-glass. A reasonable pressure will expel any air bubbles which may have been imprisoned.

All insects do not prepare thus easily, the Lamellicorns among others, have the tarsus so slender that their immersion in the potash renders them easily detachable.

In general it would be well to operate upon several insects at the same time to be certain to find one among the number which would prove satisfactory, as there are so many chances of failure even with the utmost care.

The Microbe of Mumps.—Prof. Von Lyden has discovered a new diplococcus (a disease microbe) in the parotid gland secretions of persons suffering from mumps, which he takes to be the "mumps bacterium." It is distinct in appearance and can be cultivated on the usual media. Attempts to inoculate animals proved unsuccessful. The diplococcus has been found, not only in the parotid gland secretion, but also in the pus of the inflamed gland.

Microscopical Investigation is said to prove that the pores of wood invite the passage of moisture in the direction of the timber's growth, but repel it in the opposite direction.

THE MICROSCOPE.

New Series, 1893.

For Naturalists, Physicians, and Druggists, and Designed to Popularize Microscopy.

Published monthly. Price $1.00 per annum. Subscriptions should end with the year. The old series, consisting of 12 volumes (1881–1892), ended with December, 1892. Sets of the old series cannot be furnished. All correspondence, exchanges, and books for notice should be addressed to the Microscopical Publishing Co., Washington, D. C., U. S. A.

CHARLES W. SMILEY, A. M., EDITOR.

EDITORIAL.

Growth of Diatoms.— Mr. G, C. Whipple has carried on a series of experiments on the culture of different kinds of diatoms, and finds that an abundant food-supply is not the only condition favorable for their rapid increase ; the temperature, the amount of light, and other factors influencing their growth. In common with all other chlorophyllaceous plants, diatoms will not grow in the dark, while on the other hand, bright sunlight kills them. The intensity of the light below the surface of the water being affected by the color of the water, diatoms are found most abundant in light-colored water. Different genera, however, exhibit differences in this respect. Melosira does not require so much light as Synedra. The weather has a marked influence on the growth of diatoms. They increase most rapidly during those seasons of the year when the water is in circulation throughout the vertical currents.

During these periods not only is food most abundant but the vertical currents keep the diatoms near the surface, where there is light enough to stimulate their growth, and where there is abundance of air. Some species display strong heliotropism moving towards the source of light.

QUESTIONS ANSWERED.

NOTE.—*Dr. S. G. Shanks, of Albany, N. Y., kindly consents to receive all sorts of questions relating to microscopy, whether asked by professionals or amateurs. Persons of all grades of experience, from the beginner upward, are welcome to the benefits of this department. The questions are numbered for future reference.*

Q. 250.—I would like to know how to preserve and mount Daphnia and similar crustaceans. In several places the Journal says: "take strong carbolic acid." I have tried every strength from that down to 2 per cent. and always find that the shells expanded like wings and antennæ drawn down to sides?—W. S. O.

Collect the Daphniæ in a very small quantity of water in a watch glass; then hold it over a lamp-flame so as to heat it quickly. The Daphniæ will die almost instantly, and may then be placed in the G. W. A. mixture (Glycerine 1, Water 2, Alcohol 3) in a watch glass, or the like, loosely covered, to protect it from dust. Allow the alcohol to evaporate and slowly concentrate the mixture. Mount in dilute glycerine or in Farrant's medium.

Q. 251.—Was Gundlach American or German? Are there two Gundlachs or only one?

A.—The only Ernst Gundlach was born in Germany.

PRACTICAL SUGGESTIONS.

BY L. A. WILLSON,

CLEVELAND, OHIO.

Pediastrum.—For exhibition at a microscopical soiree, few things are more interesting than a pediastrum. They generally can be found in most collections of water especially the filtering of the water supply of the great lakes. Diligent search may often discover myriads of them in ponds. They are described in Carpenter's Seventh Edition at page 498.

To exhibit a pediastrum, place one on a slide covered with water, move the slide to exhibit the object in the center. It will be best to display the specimen with a one

inch objective and a high eye piece. Expensive high power objectives are not favorable instruments at a soiree of laymen. They will be just as well pleased, if not more pleased, with the combination suggested,

Pollen Grains.—At a soiree pollen grains will always show nicely and excite wonder under a spot lens or a parabaloid. The writer remembers a meeting of scientists, not microscopists, to investigate the Cerus grandiflora. Some of the eminent microscopists made some demonstrations that were almost astounding to the initiated, yet the non-microscopists deemed the spot lens exhibit of the pollen grains the most remarkable of the exhibit.

Section of Potato.—Nothing is prettier for a soiree exhibit than a section of a common potato, shown by polarized light. Such a section may easily be made with a common razor, the thin part utilized and the section dried, hardened in alcohol and mounted in balsam. The alcohol will wash out a part of the starch but will thus improve the specimen for enough of the starch will appear and where the starch is washed out the cellular tissue will remain.

A Dissecting Microscope.—Good mounting can seldom be accomplished without a dissecting microscope. The best instrument may be obtained from dealers. The essentials of the instruments is the lens working by a rack and pinion with a mirror and a stage to work on so that both hands may be free. A temporary instrument may be devised with a reading glass or a hand magnifier. Most wonderful work may be accomplished with an improvised machine, just as Gallileo made wonderful discoveries with his imperfect telescope.

SCIENCE-GOSSIP.

Why it is Tiresome to use High Powers in Examining Microscopic Objects.—Mr. J. M. Blake of Westville, Connecicut, illustrates the point very forcibly in a recent issue of *Observer*. He says: "One can get very tired of just

looking over a not large spread of fine material, on a slide magnified say 500 diameters. The labor required to go over the whole mass of detail with close attention, is considerable. We will take a spread five-eighths of an inch square. This magnified 500 times would give 312 inches, or twenty-six feet square. Let the magnified field under close observation at one time be three inches square, the distance of the eye being ten inches. This field will in practice be found to be really too large, when fine detail is scanned. The number of three-inch fields will be 10,816, which, run past at the rate of one a second, would take three hours."

Microbe Farming.—The mystery of nitrification is now so well-known that any farmer can understand it. Plants live in nitrogen, but apparently have no power to take it either from the air or the soil. Here the nitrogen bacteria get in their work. These microbes, like atomic sponges; take in the nitrogen from the soil and the air, and transform it into nitric acid, in which form the plant can consume it. A soil may be destitute of nitrogen and need both that and the microbes, or it may lack both that and the microbes, or it may lack only the microbes, in which case a supply of them renders the field immediately fertile. Stable manure has little nitrogen but swarms with the germs of microbes. Add to a field where clover seed wont "catch" a light dressing of soil from a plat where clover thrives to perfection, and a catch of clover seed is almost sure to result. Why? Because the soil added is full of the germs or microbes that enable the young clover plant to avail itself of the nitrogen in the ground or air.—Am. Agriculturist.

A New Method of Staining Nerve Tissue.—Vastarini-Cersi (Rif. Med., Feb. 14, 1896) describes a new and effectual method of staining the spinal cord, etc., for microscopic purposes. The entire cerebro-spinal axis, with the meninges, is plunged into about 3 litres of an aqueous solution of formaldehyde (16 per 1,000). The tissue is left in the medium for two weeks; the meninges being re-

moved on the second or third day. Sections from 3 to 5 cm. thick are then cut and kept in distilled water, or, better, in alcohol at 40 degrees, for twelve to twenty-four hours; then plunged into 75 degrees solution of Aq N O3 in the dark. The white substance soon becomes stained brown. A prolonged stay in the Aq N O3 sol. does no harm. The stain may be fixed for an indefinite time if the preparation is left for two or three days in the dark in distilled water and then in alcohol at 70 degrees. Tissue so prepared shows in the clearest manner the relations between the white and the grey substance. For example in the medulla one could distinctly see with the naked eye the respiratory fascicules of Krauss. The advantages claimed by the author for this method are its simplicity and rapidity of execution, the constancy of the results and its great teaching value.—Brit. Med. Jourral.

RECENT PUBLICATIONS.

Joan of Arc.—By Francis C. Lowell, 8mo. 382pp. Published by Houghton, Mifflin & Co., 1896.

In this work the author has given a rather complete account of the condition of France from the middle of the fifteenth century to the close of the hundred years war with England. The volume is interesting as a history of the times, and as such is necessarily a chronical of the life, trials and execution of Joan of Arc, who was really the central figure around which the lesser lights of that time revolved. At the time she was the mystery of all Europe and to-day she belongs more to occult students than to nineteenth century scepticism. History has brought down to us certain facts and many mysteries concerning the Maid of Orleans, and it is unnecessary to enlarge on them here. That Joan actually lived, raised the siege of Orleans, foretold the coronation of Charles VII at Rheims, stormed Paris in September, 1429, was captured at Compiegne, sold to the English, tried, condemned as a witch,

some one was burned at the stake and she was vindicated by the French government after her death, there is absolutely no doubt.

Whether she was inspired, clairvoyant or clairaudient is a question which each and every reader must establish from his own way of thinking. The author does not seek to establish any theory on this subject but reports the facts and speaks of the voices heard by Joan, as if actually existing so far as Joan was concerned, and to her mind they undoubtedly did exist.

The unselfish motives of Joan as well as her personal bravery and her natural brightness are all clearly set forth. The other historical characters such as Charles VII, LaTremoille, Burgundy, Cauchon, etc., are also fully described and when compared with the motley crowd of traitors and cowards which infested France at the time, Joan seems little less than a saint. The sympathy of the reader cannot but be with the Maid of Orleans, and the writer has undoubtedly intended that such should be the case for he has set forth the opposition she met with and overcame as well as the cowardly conduct of the king and his followers. The difficulties she surmounted and the hardships she endured for the good of France might well indeed have tried the courage of the bravest men.

The author has cited a great many authorities for statements made throughout the work and the references are conveniently placed at the bottom of the pages containing the statements in question. Another excellent feature is the chronological notes on the margin of the pages. This enables the reader to, at once fix the date of the events without having to look backwards or forwards through the text to find the year or month. The volume has an appendix on the character of Charles VII and notes on Joan. A complete index is also added.

Typographically the work is excellent.

PERSONALS.

Dr. Traill Green, LL. D., died lately in Easton, Pa.

THE MICROSCOPE.

Contents for May, 1897.

THE MICROSCOPE

JUNE, 1897.

NUMBER 54 NEW SERIES

Professor S. H. Gage,

ITHACA,

N. Y.

Through the kindness of Dr. Whelpley we are able to present the portrait of Professor Simon Henry Gage, best known as the author of "The Microscope and Microscopical Methods" which has passed through several editions. The latest, that of 1896, recently issued is much larger, fuller and better than any of the five preceeding editions.

Professor Gage occupies the chair of Microscopy in Cornell University at Ithaca, N. Y., where he has lived for many years years. In 1894, he was elected president of the American Microscopical Society and delivered the annual address, in 1895, the society coming to Ithaca to hold its meeting in Cornell University.

We clip the following from one of our Exchanges.

"The Author of Gage's Microscopical Methods has done more than any other worker to introduce careful and proper methods in microscopical technology. Never before has a writer in any language attempted to give the clear and detailed information found in Gage's work. The author is Professor of Microscopy, Histology and Embryology in Cornell University and the New York State Veterinary College. The book is now in the sixth edition."—Meyer Brothers Druggist.

Troy Scientific Association's Reception.

Objects exhibited, under 18 instruments,

BY R. H. WARD, M. D.

TROY, N. Y.

VIEWS IN FLOWERS*.

Disk Flower of Chrysanthemum; Composite Family. Actual Size about 1 millimeter (1-25 inch) wide and 5 mm. long. Below is the ovary filled with an ovule; above is the corolla tube, which has begun to separate, toothed at top, where protrudes the style forking into two stigmas. No "pappus."—

Stamem of Pinxter Flower, Azalia nudiflora; Heath Family. Shows pollen-grains escaping from the 2-celled enthers by terminal pores.

Pollen of Pumpkin Flower, Cucurbita pepo; Gourd Family. Spiny globular grains.

Pollen of Evening Primrose, Œnothera biennis; Fam. Onagraceæ. Grains triangular, knobbed.

Pollen of Milkweed, Asclepias. The grains from the anther-cells are united in waxy, pear-shaped pollen masses, which are suspended in pairs as here, favorably for distribution by insects. (Shown in a minute microscope, achromatic compound, less than two inches long and one-half inch wide).

Spadix of Caladium petiolatum; Arum Family. Transverse sec., stained. A pithy axis with fibro-vascular bundles, covered with flowers, each consisting of only a simple pistil containing two ovules (seed germs).

Ovary of "Candytuft" Flower, Iberis amara. Mustard Family. A short, flat, scale-like ovary, of two carpels, each of which is filled by a large ovule in which a growing embryo is seen.

---

*There were many exhibits by other people but this is the largest exhibit ever made by one person so far as recorded.

Ovary of Begonia Flower. Trans. sec. Three thin-walled carpels united in a winged triangular pod, each containing a spike of numerous ovules.

Pistil of Orange flower, Citrus aurantium ; Orange Family. Trans. sec. through ovary (the young orange). In some of its ten cells ovules are seen changing to seeds.

Bud of Lily Flower. Trans. sec., stained. Triangular pistil, of three united carpels, surrounded by six anthers, each two-lobed, with four cells full of pollen ; three petals and three sepals forming a "perianth" around all.

Flower-bud of Fleur-de-lis, Iris germanica. Trans. sec., stained. In center three broad petal-like styles of the pistils; opposite these, three anthers of the stamens, each of two wide, two-celled lobes containing pollen; outside, a perianth of three leafy petals and three clumsy sepals bearded within.

Flower-bud of Clematis japonica; Crawfoot Fam. Trans. sec., stained. Many styles in centre; numerous anthers of 2-celled lobes with pollen; four petaloid sepals around all, valvately arranged, with edges turned in.

Flower-bud of Eschscholtzia californica; Poppy Fam. Trans. sec., stained. Two styles; many anthers with two stalked one-celled lobes full of pollen, surrounded by petals and cap like calyx.

Winter Flower-bud of Plane Tree, Platanus occidentalis. Trans. sec., double-stained Terminal spike (the young catkin) of rudimentary flowers, protected by layers of woolly bracts.

Pistillate Spike of Indian Corn, Zea mays; Grass Fam. Trans. sec., stained. A young cob of corn, unopened. Delicate pith, with fibro-vascular bundles; covered with ovaries changing to fruits (the young kernels of corn) ; surrounded by the styles of lower kernels ; many leafy layers of the husk outside.

Head of Flowers, of Dandelion, Taraxicum dens-leonis; Composite Fam. Vertical sec., stained. Flat disk at

bottom, surrounded by leafy bracts of the "involucre." On this, numerous flowers, each having an ovary containing an ovule in which an embryo plant has begun to form; and above, a slender pink corolla-tube, in which is seen a style and some pollen-grains. Between the corollas are the abundant white bristles of the "pappus."

Young Fig, Ficus carica. Long. sec., stained; showing the "fruit" to be only a hollow flower-stalk, or "receptacle," its cavity lined with minute bowers and closed at top with leafy bracts.

Academy of Sciences—Microscopic Soiree.

A large audience gathered in Elmira, N. Y., to attend the annual microscopical exhibition, which was under the management of the chairman of the section of the academy devoted to microscopy. Vice-President Joslyn congratulated the society on the completion of its thirty-sixth year, and also congratulated President M. C. Arnot on the success of the first year of his administration. Dr. Anna B. Stuart delivered an address on the history of microscopy in Elmira, beginning with the work of Drs. Gleason and Up de Graff, discussed at some length the value of the microscope in medical study, and made allusions to Spencer and Tolles.

Some of the exhibitions were as follows: Dr. E. C. Eddy, Dr. Jonas Jacobs, Daniel Dexter, Adelaide L. Dexter, Frank Robbins, with camera attached, I. B. Coleman, Dr. Jessie Herrick, Dr. F. B. Green, Dr. T. F. Lucy, Dr. Ford, with half a dozen instruments, and young ladies from the college assisting, Mrs. C. F. Carrier, J. A. Secor, Dr. Anna B. Stuart, Dr. H. W. Fudge, Miss Lillian Herrick, Dr. F. D. Adriance and J. R. Joslyn, besides a number of instruments lent to Dr. Stuart, including Dr. Gleason's splendid microscope. The exhibition brought out a host of mounted slides, and there were shown large numbers of living objects from the vicinity.

The Microscopical Proof of a Curative Process in Tuberculosis.

By CHAS. DENISON, M. D.,

DENVER, COLO.

Tuberculin and antipthisin (Kleb's) which is considered by some (Trudeau and Baldwin) only a modification of it has not impressed the medical profession with its great worth as a means of treatment, for reasons the professiòn are probably responsible for, though as a diagnostic of tuberculosis its position is well recognized by veterinarians.

The purpose is to diagnose tuberculosis and differentiate its varieties by the microscopic examination of the blood alone, without the patient being seen.

It was to apply Dr. Holmes' method of staining and blood examination in order to determine the cell changes induced by the reaction to tuberculin, that I asked Dr. Holmes to study with me two of my cases some ten weeks ago. The results are new, and I am gratified to present them in so clear a form, considering the short time the study has been in progress. Much credit is due Dr. Holmes, for I am unaware that just this method of study and comparison has been carried out by any one else. Case one was primarily a pulmonary, and afterward a surgical tuberculosis affection.

Case 1—Male, age 38, first seen July 26, 1895 : married; mother had died of consumption; had la grippe two years previously, followed by cough, and last winter another attack, when he had night sweats. Weight about 150; not decreased, because of good living and care; only slight effect of elevation ; cough not severe ; expectoration whitish, about one ounce in twenty-four hours and containing tubercle bacilli, three to five to field, streptococci and diplococci. Some infiltration and dullness at left apex, and very slight impairment of respiratory

sound on right side. Diagnosis — Fibro-tuberculosis, first stage. Treatment—To use the inhaler, because of the bronchitis and mixed infection and to go to the mountains.

Commenced tuberculin (Koch's) September 9, with ultimately gradually increasing intervals between the injections. The reactions were light and only occurred after a few of the smaller doses. About 60 milligrams as a maximum dose was reached. The sputum cleared up (the germs disappearing) and before Dec. 19 ceased altogether.

Up to February 7, 1896, the lung condition continued most favorable, but the tuberculosis had not been wholly eliminated from his blood, for a small abcess then came underneath the scalp above the forehead, the pus from which was found to contain tubercle bacilli. These conditions both improved under drainage, the renewal of tuberculin and the administration of hypophosphites with hydriodic acid.

April 15, 1896—Dr. J. J. Powers operated on the right elbow and we found, as we expected, necrosis of the ulnar (both front and back sides of it near the end), the joint, perhaps, just escaping. A conservative plan was decided upon—to rather freely expose and scrape the diseased bone, after which the wounds were thoroughly packed with iodoform gauze.

June 13— The dressings were continued until the wounds had healed by granulations from the bottom. During the time of and preceeding the operation on the elbow for three or four weeks, no tuberculin was given, and it was during this period when the necrosis of the ulnar was well under way, that the first blood examination—namely, that of April 11—was made by Dr. Holmes, indicating, as he stated, a serious inflammatory state of the blood and some bone affection— i. e., "an excess of bone marrow or spleen activity."

The tuberculin was then continued and given about every fourth day, from about the first of May to June 13 in gradually increasing doses, from 20 to 70 milligrams for a maximum dose, till there was finally no reaction to speak of to those larger doses. This was during the time the other four blood examinations were made, the increase of the young or new cells, the small lymphocytes being in exact harmony with a decided improvement in the patient's condition in every way—in weight, appetite, strength, feelings, mobility of the affected joint and ability to exercise.

Our inability to find the bacilli tuberculosis in tissues evidently tuberculous in patients afterward dying of tuberculosis, shows that there is a pre-tuberculous state, of which some evidence besides the bacillus of tubercle must be found. Whether that evidence is to be found in the proper microscopic examination of the blood, or as I believe it does exist in the tuberculin test, there is no doubt in my own mind that the two methods will go hand in hand and verify or check each other.

A Bacteriological Outfit.

BY H. KAHN,

MERCY HOSPITAL, CHICAGO, ILL.

The pharmacist of the future must be a scientific worker if he desires to take advantage of his opportunities.

The time is not far off when the educated pharmacist will be expected to make most, if not all, of the bacteriological and chemical examination for the busy practitioner of medicine. The laboratory has come into medicine to stay, and there are very few physicians of the present day who do not place much reliance on its findings. The examination of sputum for tubercle bacilli, the examination of blood for malaria plasmodia, and the testing of

various suture materials as to their sterility, are but a few of the possibilities of the pharmacist's occupation.

The cost of apparatus for the ordinary work of a bacteriological laboratory is not great, being about $175. The following is a list of the most important requirements: Microscope, slides, cover-glasses, platinum wires, plates, sterilizer, incubator, gas-regulator, test tubes, stain bottles, cornet forceps, enameled iron buckets, flasks, retort stand, gas-burners, water-bath, wire baskets, stains, gelatin, agar-agar, peptone, and cotton.

Microscope.—Select the Continental model on account of its great stability and ability to stand much use without getting out of repair. The stand should be well finished, furnished with a graduated draw tube, rack and pinion coarse and micrometer-screw fine adjustments. A large and heavy bore makes the instrument steady, even when the tube is tilted. A large stage of vulcanized rubber, fitted firmly to the stage-bed, is better than either brass or glass, on account of its durability, since it is not attacked by chemicals and does not break readily. The sub-stage should be fitted with an adjusting screw of fine pitch, so as to admit of the adjustment of the condenser. The condenser should be large, fitted with an iris diaphragm and if possible with a ring, attached below, to hold a blue glass when working with artificial light, and an adjustable mirror with one side plane and the other concave.

The best combination of objectives for this work is three-fourths and one-sixth inch dry, and one-twelfth inch oil immersion, fitted to a triple nose-piece. The three-fourths and one-sixth inch lenses should be free from spherical and chromatic aberration. A one-twelfth inch oil immersion lens that will give an absolutly flat field cannot be purchased for a moderate amount; but one that will give a clear picture of stained tubercle bacilli with full illumination is sufficiently good for this work.

Eye-pieces 1 and 3, Continental, may be selected.

Slides.—Two kinds are necessary: the ordinary, for mounting specimens; and the hollow, used for the hanging drop. Of the former, about one-half gross should be purchased, and of the latter about six are required.

Cover Glasses.—No. I, three-fourths inch square or round, may be bought. The squares are the most convenient and less expensive. The principal objection usually urged against them is that they are difficult to clean without breaking. This I have found not true if an ordinary amount of care and not too much pressure is used.

Platinum Wires.—Pieces of No. 24 wire about three inches long should be fused to glass rods six or eight inches long. Four of them are necessary.

Plates.—Petri dishes are the most convenient, and six or nine will be required for a small laboratory. If Koch plates are desired, then, of course, the cooling apparatus, benches, moist chambers and sheet-iron sterilizing box must also be purchased.

Very satisfactory Koch plates can be made from clear window-glass. Benches may be made by fastening small pieces of thick plate-glass to strips of window-glass with sealing wax or some other suitable material.

Sterilizer.—One large Arnold is all that is necessary.

Incubator.—An ordinary water-jacketed drying oven such as chemists use, makes a very satisfactory brood oven. It is, of course, understood that one must have a small burner, gas-regulator, and a thermometer, in order to complete the apparatus.

Stain Bottles.—At least six should procured; twelve would be better. A very good and economical bottle can be made by taking an ordinary half ounce wide-mouth bottle, fitting it with a good tight stopper through which has been introduced a straight medicine-dropper.

Forceps.—Two kinds are needed—the cornet and cover-glass forceps. Two of each are required.

[A pair of cornet forceps whose jaws meet at an acute angle is useless.]

Enameled Iron Buckets.—Buy two of 1,000 cc. capacity and one of 500 cc. These buckets may be used instead of beakers in the manufacture of culture media. They are not expensive and do not break.

Flasks.—Ordinary Florentine or Erlenmeyer flasks, of 1,000 cc. capacity, will answer. Three at least will be needed.

Retort Stand.—This should be large, with three rings.

Stains.—Small quantities of methylene blue, gentian violet and fuchsin, will suffice.

Agar-agar.—Four ounces.

Gelatin.—Gold label, one pound.

Peptone.—American, four ounces.

Besides the above-mentioned articles, one must have a Bunsen burner, alcohol lamp, an ordinary water-bath, six wire baskets for test tubes, one-half gross five-eighths by six-inch test tubes, some good neutral litmus paper, and two thermometers that will register to 150°C.—Bulletin of Pharmacy.

Rotting of Fruits.—According to C. Wehmer, the fungus which most commonly causes the rotting of fruits is Penicillium glaucum. In apples and pears this is accompanied by Mucor pyriformis, and in the case of medlars the latter is much the most common fungus. In lemons, oranges and other tropical and sub-tropical fruits, P. glaucum is associated with two other closely allied species P. italicum and olivaceum. In plums, Mucor racemosus was also observed. In grapes Penicilium glaucum and Botrytis cinerea are the most common fungi. It is the latter species which forms the grey tufts on walnuts.—Beitrage zur Kenntniss Einheimischer Pilze, 1896.

THE MICROSCOPE.

New Series, 1893.

For Naturalists, Physicians, and Druggists, and Designed to Popularize Microscopy.

Published monthly. Price $1.00 per annum. Subscriptions should end with the year. The old series, consisting of 12 volumes (1881–1892), ended with December, 1892. Sets of the old series cannot be furnished. All correspondence, exchanges, and books for notice should be addressed to the Microscopical Publishing Co., Washington, D. C., U. S. A.

CHARLES W. SMILEY, A. M., EDITOR.

EDITORIAL.

Bubonic Plague.— Latest intelligence from Bombay, India, shows a marked and encouraging decline in this fearful disease. It is not spreading in other localities to which it had been carried. Prompt and efficient restrictive means were inaugurated and judiciously and persistently employed and this dread disease, it is confidently believed, will soon be stamped out— a consummation devoutedly to be wished.

Water Coolers.— These are liable to infection from sources outside of themselves. The ice may be polluted from the hands, as bacteria are often obtained from bits of epidermis scraped from the fingers. Coolers are often filled with water drawn in recepticles none too clean. The coolers may have been wiped with soiled or dusty clothes, they are often left unwashed and containing sediment of organic matter, which, decaying, furnishes food for many kinds of virulent bacteria.

Even artificial ice is not always safe. Upon examination, in one piece was found many colonies of a kind of bacteria which corresponded biologically with the Staphylococcus pyogens aureus. This organism was lost before its pathogenic properties were determined, but it doubtless is identical with the golden pus coccus. Its presence

is probably explained by the fact that some one having a suppurating wound had handled the cans, thus causing the infection. The coldness of the ice is not injurious to these minute forms. They yield to heat but not to cold. Some people boil water to purify it and then cool it with ice thus reducing the dangers considerably.

Correction.— In Professor Hyatt's article on page 67, line 21 for "Holding the brush" read: Holding the slide. In 3d line from bottom of p. 67, read bran for "loan."

PRACTICAL SUGGESTIONS.

By L. A. WILLSON,
CLEVELAND, OHIO.

Skill needed.— This instrument is an extension and enlargement of the vision only. With the instrument alone, we can discover nothing. The brain behind the machine does the work. In proportion as this brain is cultivated will the manipulation be advanced. For example, it would be wicked for an ordinary microscopist to swear that a certain specimen of blood was human blood and not dog's blood ; yet it is claimed that experts, who have devoted their lives to such measurements, can safely attest the kind of blood. A species of lichen can often be differentiated from an allied species by the measurement of the spores when corroborated by other particulars.

Purchasing an Outfit.—We must crawl before we can walk and we must lisp in the accents of childhood before we can speak with the voice of a man. So it is with buying an outfit. A beginner should buy a good stand, with a society screw and a substage ; and start with low power objectives. As knowledge and facility of manipulation grow upon him he will naturally procure higher powers and substage arrangements.

What shall we look at?—All nature is now alive, the plants, the ponds, the lakes, the woods, everything is teeming with minute life. It is impossible to turn without finding something interesting or beautiful. He will see the most who choses some special branch of natural science

and seeks to master it. No one can be great in all branches. All love to know a little about everything. A nice little book to start a student on his way is "A Guide to the Microscopical Examination of Drinking Water," by J. C. McDonald, M. D., published by P. Blakeston & Son & Co., Philadelphia.

Hands Off.— When exhibiting the wonders of your instrument to the uninitiated, they are very apt to grasp the tube while looking through. Never fail to protest. This grasping is utterly unnecessary and it positively destroyes the lacquer. It, after much handling, will look as if it had had the small pox; the bright golden polish which is produced by lacquer can easily be tarnished.

QUESTIONS ANSWERED.

Note.—*Dr. S. G. Shanks, of Albany, N Y., kindly consents to receive al' sorts of questions relating to microscopy, whether asked by professionals or amateurs. Persons of al. grades of experience, from the beginner upward, are welcome to the benefits of this department. The questions are numbered for future reference.*

Q. 252.—Kindly advise me. What is the retail price of Fresh-Water Sponges by Edward Potts? B. W.

A.—It can be had from Queen & Co., of Philadelphia and costs $1.56 postage paid. It is a reprint from the Proceedings of the Academy of Natural Sciences, Philadelphia, Pa., 1887.

Q. 253.—What is the address of Edward Potts?

A.—We do not know. Can any subscriber tell?

SCIENCE-GOSSIP.

Royal Microscopical Society.

Mr. F. Enoch, showed under the microscope a unique collection of specimens of a "much-neglected family"—viz., the mymaradæ. These insects, some of them much tinier than a grain of sand are egg parasites, that is to say

they prey on the eggs laid by other insects, — some of them in the live bodies and still others minute denizens of London trees. The researches conducted by Mr. Enoch have brought to light some hitherto unknown genera, and one of the latest was discovered at Holloway. Mr. Enoch prpares, mounts, sketches and photographs the specimens for which he hunts by night and day in London and the suburbs, and the exhibition which he arranged was of much interest.

Microbes in Ink.—Those who have much work with the pen sometimes puncture the skin by accident. Occasionally the wound becomes painful the cause being attributed to the presence of pathogenic microbes. Dr. Marpmann, of Leipzig, has recently published the results of the microscopical examination of 67 samples of ink used in schools. Most of these inks were made of gall-nuts, and contained saprophytes, bacteria and micrococci. Nigrosin ink, taken from a freshly opened bottle, was found to contain both saprophytes and bacteria. Red and blue inks also yielded numerous bacteria. In two instances Dr. Marpmann succeeded in cultivating from the nigrosin ink a bacillus which proved fatal to mice within four days. This ink had stood in an open bottle for three months, and the inference drawn from the inquiry is that ink used in schools should be kept covered when not in use.

RECENT PUBLICATIONS.

The Open Court.—The editor discusses in the June number, The Immorality of the Anti-Vivisection Movement. He regards certain features of the anti-vivisection crusade as extravagant and, in so far as the sentiment on which it is based is unreasoned, he views it as immoral. He takes as his text the article In the Dissection-Room, in the same number, where the ethical and utilitarian aspects of dissection are considered.

THE MICROSCOPE.

Contents for June, 1897.

THE MICROSCOPE

JULY, 1897.

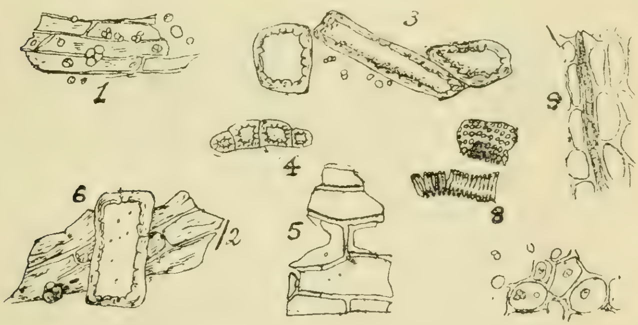
NUMBER 55 NEW SERIES

Objects Seen with the Microscope.

BY CHRYSANTHEMUM.

XL.—STRUCTURAL CHARACTERISTICS OF SOME IMPORTANT DRUGS.

Aconiti radix.—The powder of this drug consists mostly of small grains. They are frequently joined



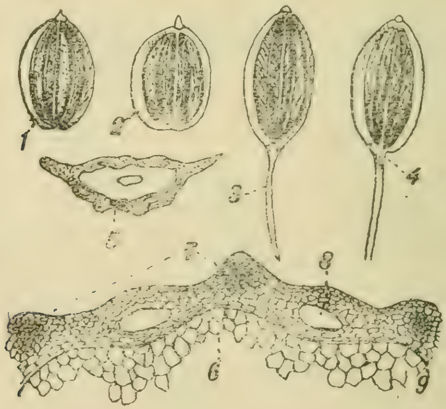
EXPLANATION OF THE FIGURE.

1. Bark parenchyma; 2. Bark parenchyma, showing cork; 3. Transverse section through endodermis; 4. Stone cells; 5. Parenchyma within endodermis; 6. Stone cells within endodermis; 7. Wood parenchyma, showing starch; 8. Fragments of vessels; 9. Endodermis.

together and the illustration given herewith shows the shape and arrangement of the grains, as found in the parenchyma of the bark and wood. The cross-section through the endoplasm and adjoining cells clearly illustrates a highly characteristic feature of the root, whilst

sclerenchymatous cells from the outer bark and others situated within the endodermis areal so shown, together with fragments of spiral and reticulated vessels. It should be remembered that, in examining this and other powdered drugs, the structural features of the particles are brought out much more clearly by adding a little potash solution. This description will enable any druggist to detect adulterations.

Anethi fructus.—The pericarp of this fruit consists of of thin-walled, tubular, tangentially-elongated cells, those in the outer rows being small and colorless. The inner rows consist of larger cells, which are brown in color, especially those near the vittæ or oil receptacles. The endocarp is a single row of tangentially-elongated yel-



EXPLANATION OF THE FIGURES.

1. Convex side of mericarp, (British fruit) ; 2. Flat side ditto ; 3. Convex side of mericarp (Indian fruit) ; 4. Flat side, ditto ; 5. Transverse section through mericarp; 6 The same highly magnified; 7. Vascular bundle; 8. Vitta ; 9. Endocarp.

lowish cells, which are very regularly arranged and rectangular in transverse section. Through each ridge runs a strong vascular bundle, and large vittæ alternate

with the ridges, whilst two occur on the flat surface or commissure of each mericarp. The endosperm consists of somewhat thick-walled, polygonal cells, which contain oil and granular proteid matter.—Phar. Jour.

Publications of the American Microscopical Society.

This Society meets annually in August, for two days, somewhere in the wake of the A. A. A. S. of which it was formerly a section. There are habitually present from 15 to 30 people who know how to use a microscope. Of course as many more visitors drop in.

Just as the parent organization publishes an annual volume, so the offspring at once aspired to do so and has done so for nineteen years. That volume takes up not only the papers read at the meeting but such others as are offered if they are good. Months are neccessarily consumed in its issue and it is an exceptionally smart Secretary who can do the work in less them 10 or 11 months. All the papers are thus held back from readers for nearly a year after they were written. When they come out they come in a lump and nobody reads them. The volume being received, a few hours are devoted to a cursory glance at the pictures, titles and headlines and it goes on a shelf for future reference. When one is at work on a particular subject he gets out the various volumes and reads up what he can find, if anything, on that subject and here ends the matter.

In a sort of dog-in-the-manger spirit a rule was passed some years ago prohibiting members from giving out their papers for prior publication elsewhere.

As a result, when we have asked them to send us their papers or abstracts for publication, they usually decline. Hence, two-thirds of our readers who number five times those of the society's membership, and twenty to fifty times the attendants at the meetings are deprived of the

information contained in those papers. Why ? Because of this dog-in-the-manger spirit. If the society cannot publish promptly, and it can not do so, it will not let us do so. We could publish the president's address and have it read all over the world in August and September. The society publishes it 10 months afterwards and nobody —literally nobody—reads it through. We could follow in October with two good papers which would also be read; in November two more and so on throughout the year. The people in the manger will not let us do this but when their volume is out they are willing we commence to to reprint it piecemeal. It would take us another whole year to do so and the cost would be so much waste, for what has once been done well, why do again ?

But behold the milk in the cocoanut! This same society can muster at its meetings only a handful of officers and office candidates unless the periodicals drum up the people. Out of kindly feeling this periodical has always done what it could in this line. The columns have always been open to the society officers in which to advertise the society and its meetings. Three months ago, the President sent in his announcement of the August meeting. We promptly printed it. Later, we asked him to send an advanced copy of his address so we may put it in type, and, the next day after its delivery, out would go our Journal for August and it goes into nearly every country on earth, China, Japan, India, Russia, Austria, Germany, Italy, Spain, Switzerland, France, England, Scotland, Ireland, South Africa, Brazil, Cuba, Chili, Mexico, Australia, Hawaii, and Ceylon.

In reply, the president wrote that if we will write to the various officers or members of the Executive Committee of the Society and get their consent he will be happy to furnish it to us. We prefer to write this partial expose of the spirit that animates this handful of people. If it does them any injustice we will promptly

and widely acknowledge our error. We are quite ashamed to tell the world at large about this local matter but evils will often vanish when exposed to the sunshine which would lurk in darkness a long time.

In a recent year, the president felt at liberty to publish his address outside the society's Chinese wall. He sent it, not to the Journal that had all the year been doing its utmost to help the society but to the Popular Science Monthly which never does anything to help the society. It does, however, pay some money for contributions at times and probably the president sold his article. When we wrote to the P. S. M. for permission to reprint it, the latter refused it, and so our readers did not see it, but a College professor enjoying a good salary may have added a trifle to his revenue.

The popular interest in microscopy is on the decline and who can wonder at it when the only society we have that might stimulate it is in such control and is actuated by such a spirit. Four years ago the Society was nearly dead. Perhaps we did as much as anyone to save it from the fate its manipulators had brought to its door.

The Proceedings have also usurped the domain of journalism by soliciting advertisements, publishing obituaries of men not members, abstracts from foreign journals and papers not read at the meetings. All this is to the injury of monthly publications and may if continued lead to the discontinuance of the latter. Only about one-half of the members of the A. M. S. take the Journals now.

Are the Society and the Journal to be made competitors through the selfish and ungenerous conduct of its officers?

Do the members wish to see both the Society and the Journals thrive and if so will they see to it that there is mutual co-operation?

Announcement of the Toledo Meeting of The American Microscopical Society.

By E. W. CLAYPOLE,

AKRON, OHIO.

The annual meeting will be held at Toledo, on August 5, 6, and 7. The Microscopical Society of that city have taken up the matter very cordially and intend to do their best to make the visit and the meeting both pleasant and profitable.

The members outside of Toledo are asked to do their part to secure the success of the meeting by their presence if practicable, or, if not, by sending contributions to be read. Short notes on methods of work, notices of observations, details of experiments are all of value and will be welcome.

There is an interesting field for the existence and activity of this society in this country and the recent advance of microscopical investigation all along the line has enlarged its scope for the worker. There is abundant material waiting to be worked over which can supply endless subjects for discussion. The demand for microscopical knowledge and proficiency in the medical practitioner at the present day is so great that few among the older members of the profession can keep pace with the requirements and one of the best methods of keeping in touch with the advance of the medical art on the part of the younger men is the maintenance of a connection with such a society. They can thereby become acquainted with methods, men, and learn from time to time in what direction and by whom their field of labor is being enlarged.

To the teacher, too, membership is invaluable. The peripatetic nature of the society which holds its meetings in different places year by year brings them within the reach of different sections of the country and so reduces

to some the cost of attendance. Any one, man or woman, engaged in any line of teaching which involves the use of the microscope can pick up hints enough from those whom he, or she, will meet to repay a moderate expenditure. And in the present day a teacher in any such line who is not progressive will soon become a fossil.

Persons desirous of joining the society either as active workers or as learners are requested to send their names to the Secretary, Dr. Wm. C. Krauss, of Buffalo, N. Y., to Mr. Magnus Pflaum, of Pittsburgh, Pa., or to the President, Dr. E. W. Claypole, Akron, Ohio.

The subscription is two dollars yearly with an entrance fee of three dollars, in return for which a member is entitled to a copy of the proceedings containing the papers read at the annual meetings.

Simple Apparatus for Photo-Micrography.

BY M. J. GOLDEN,

LAFAYETTE, IND.

This device enables one to secure a photograph of a section with little loss of time, and with little disturbance of the section.

The device consists of a piece of board, about an inch thick, forty inches long and about twelve inches wide, to which are attached a shelf to hold the microscope, and a sliding piece with a pair of brackets to carry the box of an ordinary band camera. Under the shelf another piece of board is fastened to the first, at right angles, and this assists in supporting the shelf, and serves as a leg to help keep the apparatus in an upright position.

The back, leg, shelf and sliding piece may be constructed from a piece of smooth pine board; and the bolts and nut used with the sliding piece are ordinary machine ones, that may be gotten at a hardware store. One of the bolts must have the same pitch as the hole in

the camera box, by which it is fastened to the tripod. One may easily make this stand for himself, or have it made by a carpenter at little cost.

The lens of the camera is removed, and a funnel made of heavy, black cloth, or some corresponding material having flexibility, put in place of it, so that light-tight connection may be made between the camera box and the eye-piece of the microscope. If this cloth funnel be terminated in a small cone, made of tin or paste-board, to fit over the eye-piece, the adjustment to the microscope can be more rapidly made.

By using a camera box, one can also use the ordinary plate holders for his negatives, and he can get his focus on the ground glass. Of course, the plates may be developed at one's leisure.

The advantage of the apparatus is that one can, with slight cost, have at hand in the laboratory, means for making a permanent record of any peculiarity in a section that he may find, with the expenditure of very little time.

It will be found that greater uniformity in the negatives from the sections can be gotten by using an artificial light rather than natural light; a Wellsbach incandescent gas lamp gives good results.

Photomicrograph of Spider's Jaws.— Orthocromatic plates can be used with good results on this class of slides. The annexed photo is not offered to prove this, as experienced hands will be able to do much better; but it shows that detail can be clearly brought out by them, where an ordinary plate would be over-exposed in some parts and the detail not out in others. These plates take the brown and yellow tints much more readily than common plates. This photo was made on a Carbutt ortho plate, 40 seconds exposure, 2 in. objective, and no eye-piece. F. S. M.

THE MICROSCOPE.

New Series, 1893.

For Naturalists, Physicians, and Druggists, and Designed to Popularize Microscopy.

Published monthly. Price $1.00 per annum. Subscriptions should end with the year. The old series, consisting of 12 volumes (1881–1892), ended with December, 1892. Sets of the old series cannot be furnished. All correspondence, exchanges, and books for notice should be addressed to the Microscopical Publishing Co., Washington, D. C., U. S. A.

CHARLES W. SMILEY, A. M., EDITOR.

EDITORIAL.

Germination of Barley.—Gruss states that when barley germinates the solution of the cell-walls of the endosperm commences in the neighborhood of the scutellum, and advances thence towards the apex of the grain, most actively in the outer part ; but there is a small portion of the apex which usually remains intact. The cell-walls are not dissolved, but corroded. Congo red stains walls that are intact, an intense red, while those that have been affected assume only a slight light-red tint. The starch grains are attacked only after the corrosin of the cell-wall, the first in the neighborhood of the scutellum. Diastase may be produced spontaneously in the endosperm of seeds that have not germinated, and from which the embryo has been removed.

QUESTIONS ANSWERED.

Note.—*Dr. S. G. Shanks, of Albany, N. Y., kindly consents to receive all sorts of questions relating to microscopy, whether asked by professionals or amateurs. Persons of all grades of experience, from the beginner upward, are welcome to the benefits of this department. The questions are numbered for future reference.*

Q. 254.—What are air spaces in aquatic plants? J. N.

Large air spaces occur in the leaf stems of aquatic plants

especially those which have floating leaves. A slice across the stem of a water lilly will show the air spaces.

Q. 255.—What is the function of sieve tubes? J. N.

Sieve tubes or sieve cells are a part of the fibro-vascular system of plants. The young growing sieve cells are lined with protoplasm (cell material) and contain a watery liquid. They are concerned in the nourishment and growth of the plant. They are very delicate structures and not easily seen when unstained.

Q. 256.—What is Gorgonia? Is it seaweed?

Gorgonia are marine polyps growing in colonies they form fantastic, branched, or fan-shaped structures resembling sea-weed but are composed of a delicate horn-like material. They are of animal not of vegetable growth.

Q. 257.—What is the address of Dr. Joseph Collins? E. E. B.

The author of the paper in the Microscope for March, 1892, regarding Edinger's Drawing Apparatus was probably Dr. Collins, of 135 Lexington avenue, New York City. He can surely be reached through Meyrowitz Brothers, Opticians, 295 Fourth avenue.

PRACTICAL SUGGESTIONS.

By L. A. WILLSON,

CLEVELAND, OHIO.

Revival of Rotifers.—Many microscopic animals endure drying and resume active life on the application of a drop of water. On a piece of bark, which had long been in a cabinet was seen a liver moss, Frullania. The leaves of this plant are complicate bilobed; the under-lobe is a helmet shaped bag. Placing the Frullania in a drop of water on a slide and covering it, I was delighted to see three of these under-lobe bags. In one of these were two rotifers (vulgaris) and in each of the others were only one. The water revived and rendered them very active. They spread their wheels and revolved them vigorously.

Demonstration of Living Trichinae.—A piece of trichinized muscle the size of a pea should be placed in a bottle in a mixture of three grains of pepsin, 2 drams of water, and 2 minims of hydrochloric acid. The whole should be kept at a body temperature for about three hours with occasional shaking. The flesh and cysts being dissolved the fluid is poured into a conical glass, and allowed to settle. The trichinæ are drawn off from the bottom with a pipette. Place them on a slide with water and examine on a hot stage. Never allow the fingers to touch trichinized flesh and, after handling, scrupulously clean all your instruments.

White Zinc Mounts.—Many workers discredit white zinc for mounting. The following method has stood the test of time and can be recommended as reliable. Prepare a lot of slides at one time and keep them on hand. Do not use the ring when first made. Procure a capsule of white zinc from a dealer in painter's supplies. From the same source procure a bottle of refined linseed oil. Squeeze a little of the contents of a capsule into a plate or upon any hard, smooth, clean surface and with a spatula rub it with a drop of the linseed oil until the mass is plastic and homogeneous. It is now ready for use. With a brush, turn rings the size desired and when finished set the ringed slide away until it becomes hard. In using these rings for glycerine mounts, fill full, cover, turn a ring to hold the cover. If the first rings be not sufficient, set the slide away for a day to harden and then build up, successively, rings of sufficient thickness. I have glycerine mounts fifteen years old that are perfect.

SCIENCE-GOSSIP.

The Microscope Merits Wider Use.—Having made a specialty in the analysis of urine for physicians, I have found the microscope an indispensable instrument at times when examinations were necessary after testing the urine. In cases where albumen was found and it did not altogether

signify that the examination was finished, the physicians desired to know if there were casts of any kind in the urine; without the aid of the microscope the examination would not have been satisfactory. This important branch of chemistry, which duly belongs to the pharmacist and chemist, is almost entirely left to the physician, who, although acquainted with the theories and tests of the analysis, are not all masters of the science, either for want of time, lack of interest, or chemicals. Unless the physician has a complete laboratory, proper attention is lost.

If the pharmacist has no use for the microscope except in special branches, and has a good one at his disposal, he will derive many benefits from it through the physicians who patronize him and find that they can use it, as their work has a call for the instruments in many instances.—Emil Ott in Bull. of Phar.

Crystals of Sulphur.— Mr. A. P. Brown states that the formation in a glassy medium is well seen in rock, as osididian and pitchstone. This may be simulated with sulphur in a solution of balsam, or in a solution of carbon bisulphide ($C S_2$) mixed with balsam. The slide was prepared by heating together pure balsam and sulphur until a clear solution was obtained. Allowing this to cool, a milky substance was obtained, a small drop of which was placed on a slide and covered, and set aside for a few days. It is usual, in summer, that crystals appear; if not the slide may be heated almost to the melting point of the sulphur when the crystals will shortly be formed. When such a glassy material crystallizes, there is always a separation of a great multitude of globular bodies, the globules of H. Vogelgesang, who considers them the elementary bodies of crystals. They may assume various elongated shapes, the Trichilis margaritis of petrology. With the globules may be seen the so-called microlites or microscopic crystals. Around these there is, in each case, a little halo from globulites, showing the exhaustion of the solution by the formation of crystals, so that there remains no material to be deposited as globulite.

THE MICROSCOPE.

Contents for July, 1897.

THE MICROSCOPICAL JOURNAL.

Contents for July, 1897.

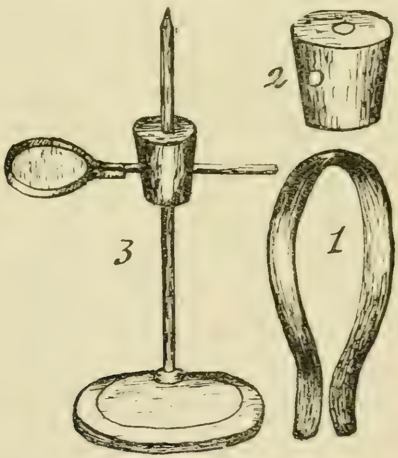
THE MICROSCOPE

AUGUST, 1897.

NUMBER 56 NEW SERIES

A Cheap Condensing Lens.

Success in the use of the microscope depends largely upon proper management of the illumination. Some objects require a soft and subdued light; others demand the most intense illumination that can be obtained, and the various ways in which the light ought to be modified so as to produce the best results, are more numerous than



most persons are aware of. Among the numerous accessories used for purposes of illumination none are more useful, or will give better results, than the condensing lens or bull's-eye condenser. And here let us explain the difference between these two: The bull's-eye condenser ought to be a hemisperical lens; a condensing lens may have any degree of curvature.

Until within a few years the condensing lens has been a somewhat expensive accessory, none being for sale at a price less than $4 to $10. We have so often obtained really good results, however, by means of very cheap and simple arrangements that we shall describe a cheap and simple affair which we once made, and which seemed to work about as well as far more expensive articles. Any intelligent boy or girl can make one.

The thing that is required first is a suitable lens. We found that one of the best lenses for this purpose is what is called by spectacle makers a *cataract* lens, of as high a power as can be had ; No. 2 answers very well. Such lenses have a short focus, about two inches, and are about an inch and a half in diameter. The cost varies from fifteen to twenty-five cents, according to the profits demanded by the dealer.

Where a cataract lens cannot be had, very good work can be done with some of the cheap lenses sold for burning glasses. In general, however, they have too long a focus. A good substitute for a lens is a small glass bulb filled with water. This we shall describe at some future time.

Having procured a lens, the next thing is to mount it. This is easily done. Get a common letter file, such as can be had for ten cents, or make one by inserting an upright wire in a block of wood as shown in Fig. 3. Procure also a good bottle cork, a piece of wire about six inches long, and one-eight of an inch in diameter, and a strip of tin about three-eighths of an inch wide and six inches long. Bend the tin into a loop, as shown in Fig. 1, the loop being the exact size of the lens. The ends of the tin strip should be made narrow and hammered into a half-round form, so as to clasp the end of the wire, which should then be placed in the tube thus formed and soldered there. A little care will be required in making the exact measurements, and fitting the loop so as to get

it the right size to hold the lens. If it should be a trifle too small, the lens may be ground down on a common grindstone. If it be too large it may be filled up with a second ring of tin, or even cardboard.

To fasten the lens in its place, various devices may be used. We fastened ours with sealing wax, and it answers very well. This was done by heating the loop until it would melt the wax, and then coating the inside of it with that material. While the wax was still soft the lens was pressed to its place, and the loop was again gently heated, so as to cause the wax to adhere to it firmly. A more mechanical and artistic method would be to get two rings of sheet tin, each an eight of an inch wide, and just such a size as would fit into the inside of the loop. These two rings are to be soldered to the loop the lens being between them. Various other ways may be suggested, but the sealing-wax answers very well.

The next step is to connect the lens and its frame with the stand, and this is done by means of the cork. Two holes are bored through the cork, as shown in Fig. 2; one passes lengthwise through the center, and the other hole passes through the cork at right angles to the first and a little to one side of the center. These holes can be made by means of a cork-borer, which is a small tube of sheet tin or brass with the edges sharp; or they can be made by first passing an awl through the cork and then enlarging the hole to the proper size by passing a red-hot wire through it, an old knitting needle answering very well. As soon as the holes have been bored, the whole may be put together as shown in Fig. 3. and the condensing lens is complete.—Popular Science.

Dangers of Barber Soaps.—The Union Med. du Canada, commenting on a recent case of staphylococcus infection contracted by a physician in the barber's chair, asks why should there not be a municipal regulation compelling barbers to sterilize their instruments.

Preparation of Insects and their Parts.

By J. TEMPERE.

PARIS, FRANCE.

[Translated from Micrographe Preparateur.]

STOMACHS AND DIGESTIVE APPARATUS.—The most interesting and the easiest to prepare of these organs is without doubt the stomach or rather the gizzard, for the greater part of insects like birds have a first recepticle or crop capable of being expanded and of holding a large amount of food which is to be ground and partly assimilated by the gizzard. The crop or first stomach consists of a very elastic sac; capable of expanding and contracting, the inner coating of which is furnished with teeth which are small and very strong. At the extremity of the neck formed by a progressive diminution, is the gizzard; this in the grass-hopper and cricket is in the shape of a little ball while in the cock-roach it is cone shaped. It is composed of a muscular membrane very powerful externally, and of hard chitinous plates armed with variously formed teeth according to the species; it is this part which is the most interesting to study.

In extracting the stomach and gizzard it is necessary to take much care and a common cricket is a good subject for practice. This may be found in all bakeries. The insect should be taken alive and killed with chloroform. Now seize it by taking the thorax between the thumb and index finger of the right hand, without pressing it much; then with the same fingers of the other hand, take it by the head and very carefully draw them apart. The head will be detached probably bringing with it the two stomachs. Insects preserved in alcohol become hard and will not permit of this operation, and in order to extract the gizzard it becomes necessary to split open the thorax and a part of the abdomen and search in the interior for the stomach.

The first stomach is prepared by cutting it the whole length, then washing it thoroughly and taking off all the material as well as the mucous, which it contains with the pincers. It is then stained in carmine and mounted in glycerine jelly.

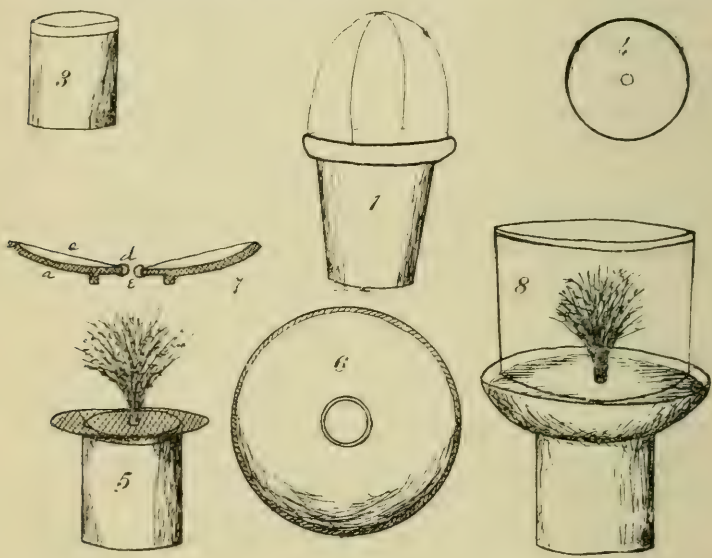
To prepare the gizzard is a little more difficult because of its small size in most cases. The part is held by small pincers with one hand while with the other a needle is introduced in the direction of the axis. It is then turned lightly between the fingers. The gizzard being thus pierced, it is cut into upon the side to open it, then it is spread out and the interior carefully washed, as it is generally covered with debris of different kinds. The muscular envelope is then detached from the chitenous part by drawing it away with small pincers. This is then spread out, dehydrated in absolute alcohol and placed in essence of lavender—then mounted in Canada balsam. The use of potash is here useless and if the chiten is too soft, an immersion for a little while in essence of lavender is sufficient.

The gizzards of insects are extremely interesting to study, and among entomologists, those who occupy themselves with the study of these insects with regard to their uses to nature come to know the internal structure of these organs and often get much information from the study of them.

Sponge Spicules.—Some years ago I put up a number of slides of calcareous sponge spicules, using oil of cloves to displace the air from the spicules, and in turn replacing the oil of cloves by running in balsam in benzine. From these slides the spicules have completely disappeared, having evidently dissolved in the balsam, which would, perhaps, retain a trace of the oil of cloves.—THOS. STEEL, Sydney. May 11, 1896.

How to Make and Manage an Insect Vivarium.

In order to understand the marvels of butterfly and moth it is necessary to gain a knowledge of the life-history of these children of the sun, from the tiny egg to the perfect insect. Many are the methods adopted for watching the various developments. Caterpillars being mostly vegetable feeders, there is no difficulty in giving them fresh supplies of food if captured. A garden-pot



half filled with loose sandy earth, with a few pieces of cane bent over, and the ends inserted in the pot, covered with gauze or net, and a string passed over it below the rim will make a very good cage (fig. 1). This is easily made and within the reach of all. A slip of the food plant should be placed in a phial of water, and put in the center of the pot, pushed well into the mould, keeping the whole in the shade, and renewing the food supply as often as needed. Arranged thus, the creatures can be watched, and the caterpillars will be seen to grow to

their full size, and fix themselves to the pot, net, leaves, or twigs, or bury themselves in the earth, turning to a chrysalis according to its species. This is the simplest form of vivarium. Another plan is to procure a fern-pot of terracotta or earthenware, such as are sold at most crockery dealers. These have an inside rim, or ledge, to which can be fitted a cylinder of perforated zinc, so that it may be removed as desired. Across the top should be stretched a piece of muslin fastened by glue or string; an elastic band will also serve. In the center of this pot may be placed a jar (fig. 3), with perforated zinc (fig. 4), through which may be placed the food-plants, and the jar sunk in the mould or sand, with which the case should be filled (fig. 5).

Many years ago I adopted a method which was most successful in rearing Lepidoptera from the egg, especially the species known scientifically as Geometræ, by means of glass cylinders. The apparatus is simple and easily constructed. First procure a shallow basin, or deep saucer; if the latter, it should be of the largest kind obtainable, through the center of which a hole must be made, a. This may be done by placing the vessel inverted on some soft substance, as a cushion or pillow, and striking it sharply with the point of some instrument with sufficient force to make a small hole (if it can be drilled, so much the better). This must be enlarged so as to admit of a brass eyelet, such as are used by blind or sail-makers. Then stretch a piece of calico over the saucer, paste it to the underside, and fasten with a ring at the reverse side of the saucer. The saucer is shown by fig. 6. The section of the same is fig. 7, the details being as follows :—a, the section of saucer ; b, rim over which the calico is stretched, and pasted at f ; c is the calico stretched from edge b to the eyelet d ; e, the hole in saucer. The portion of the eyelet which passes through the hole must be cut in such a way that the edges

will bend over and hold the ring. After this has been satisfactorily done a glass cylinder must be obtained. This is simply an ordinary glass shade with the top cut off. These may be obtained at some of the stores ; but if not, a shade can be easily cut, so that when ready it is open at both ends. The size of the cylinder must depend upon the diameter of the dish or saucer. It should be about 1 in. less than the latter, so as to stand within freely. To form a cover for the top, a piece of fine white muslin or net should be obtained, cut and pasted to the edge of the glass. It had better be as large a mesh as possible, so as to allow free access of air. A jar is now required to hold the water in which the stems of the food-plant may be placed. This should be of sufficient size so as to take in the foot of saucer or basin. The food-sprigs must be passed through the hole into the water, and when finally arranged should be as shown by fig 8.

In order to excel in the art of insect rearing ; it is necessary to build what is known as a butter-fly park or vivarium, which in structure is something like a fern-case. This will enable the collector to observe the many wonderful changes that take place in insect life, and if this house is carefully constructed, it will also serve as an ornament to the drawing-room or study. This house is not difficult to build and fit. Insect rearing is not an occupation for summer only, but one that can be followed very nearly the year through, having, of course, regard to the temperature, for many species of insects hybernate during winter, especially those of the later broods. Though not so much care and attention is needed during the winter months, the chrysalids or pupæ will require attention and proper keeping so as to perfectly develop in early spring. Moreover, during the late autumn and mild days of winter, pupæ digging may be taken up to the advantage of the collector.—English Mechanic.

THE MICROSCOPE.

New Series, 1893.

For Naturalists, Physicians, and Druggists, and Designed to Popularize Microscopy.

Published monthly. Price $1.00 per annum. Subscriptions should end with the year. The old series, consisting of 12 volumes (1881–1892), ended with December, 1892. Sets of the old series cannot be furnished. All correspondence, exchanges, and books for notice should be addressed to the Microscopical Publishing Co., Washington, D. C., U. S. A.

CHARLES W. SMILEY, A. M., EDITOR.

EDITORIAL.

Science–Gossip, which has been in former years one of our co-laborers, has just resumed attention to microscopy and puts out a page and a half of notes edited by J. H. Cooke, F. L. S. who was at one time Editor of the Mediterranean Naturalist and is now on the staff of the South Kensington Museum. This July instalment will doubtless be followed by other and longer collections of notes. The subscription price of Science-Gossip is only $1.62 per annum.

Trichinosis.—On Feb. 5, 1897 an Italian who had eaten Bologna sausage was taken into the Philadelphia Hospital suffering intense pain in legs and thighs. He had had chills and vomiting but no diarrhea. His face had begun to swell. There was edema of the eyelids, swelling over the molar bone, skin red and shiny, tongue coated and dry. There was nothing unusual visible on the legs but the least pressure caused pain. The tenderness was diffused and not confined to bone, nerve or blood vessel. Some sleepless nights and great pain followed until March 2d.–almost a month. On that day he consented to the removal of a piece of muscle from the left gastrocnemius. It showed a large number of non-encapsulated embyronal trichinæ scattered among the muscle fibres. The opera-

tion so relieved the pain that he was willing to have a second piece of flesh cut out March 17th. This contained embryos with beginning capsule formation. Some of this muscle was fed to two white rats to see the effect on them. Other trichinous meat was got from Dr. Salmon and fed to other rats and guinea pigs to determine the path of migration of the embryos and the changes in infected muscle fibres. No results have been reported.

The blood was examined Mar. 10, the result showing 4,230,000 red cells per c.mm., hemoglobin 74 per cent and 8,000 leucocytes per c.mm.

Brown in "Studies on Trichinosis" at Johns Hopkins Hospital, in April, 1897 found as high as 68 per cent of eosinophiles with corresponding decrease of polymorphonuclear neutrophiles to 6.6 per cent.

Of 1,267,329 hogs examined by the Bureau of Animal Industry for export during the year ending June 30, 1892, over 2 per cent or 25,899 were pronounced trichinous. Prof. E. L. Mark, of Harvard, examined over 3,000 hogs raised near Boston from 1883 to 1888 and found 13 per cent to be trichinous. Of 234 slaughtered in Mass. for use in state institutions nearly 18 per cent were trichinous.

In the past 33 years 357 cases of trichinosis have been reported in American Medical journals. Of these 243 recovered, 80 died—a mortality of about one in four. A paper on tho subject by Dr. Packard from which these facts are taken is printed in the Chicago Journal for July 10, 1897.

PRACTICAL SUGGESTIONS.

By L. A. WILLSON,

CLEVELAND, OHIO.

Ringing Mounts.—The name of mediums for ringing mounts is legion, but none gives neater or more satisfactory results than liquid shellac. Dissolve the shellac in naphtha and use without further admixture of any kind.

Mounting Small Insects.—Small insects hardly need soaking in caustic potash, as turpentine or oil of cloves

will render them, after a while, quite transparent when their internal organs may be beautifully seen with a binocular microscope.

American vs. Foreign Microscopes.— A great many people entertain the idea that in order to obtain a first class microscope, it must be imported. Nothing is more foreign to the fact. While it cannot be denied that many fine instruments, objectives and accessories are produced abroad every expert will depose that some of the finest instruments, objectives and accessories are the fruit of our own country. Before sending to the old world, examine the catalogues of American makers.

Mounting with Glycerine Jelly.— When using this medium it is well to use a shallow cell of shellac turned and centered upon the slide. The specimen to be mounted should be first soaked in a dilute solution of glycerine. The jelly when cold is hard and stiff. Before using, set the bottle of jelly in rather hot water. In a short time, it will become limpid. Place the specimen to be mounted in the center of the ring. With a little spatula dip out enough of the limpid jelly to fill the ring and cover the specimen. Breathe on the cover glass and then put it in place. With a rubber-tipped pencil press the cover down and into position. When the jelly has hardened (which it will quickly do) scrape off any superfluous jelly on the slide outside of the cover. Seal the mount with Brown cement, Marine glue or shellac. Then finish with a ring of asphalt or Brunswick black.

SCIENCE-GOSSIP.

Spores of Vaucheria.—Early in May I found an alga in a cattle tank, evidently a Vaucheria. There were interspersed with it a number of spherical bodies, 100-110 mm. in diameter, with either one or two filaments, 30-35 mm. in diameter, running out from them, and which I take to be spores germinating. These filaments branched into larger ones, and on one of the later, measuring 50 mm., there occurred the nearly matured "flowers" similar to

those of V. sessilis, the oogonia measuring 50 by 70 mm. Now as the mature spores (or oospores) are usually about the same size as the oogonia and threads, the inference seems to be that plants of this genus may fructify at any stage of growth. Otherwise, how is the discrepancy between the presumably last year's spores and the new oogonia to be accounted for? Then, further, as Cooke gives 70 mm., and not 100 mm., for the size of the spores of V. sessilis, what species is this likely to be?—W. P. Hamilton, Shrewsbury.

Sharpening Microtome Knives.—I have used the No. 2 Carborundum of the 'sizes' 220, 1 minutes and 10 minutes, suppled by the Carborundum Company, Monongahela City, Pa. That it is possible after the knife has once been ground to shape to grind out a bad nick in a few minutes, which greatly minimizes the annoyance of cutting resistant tissues. After the edge has been smoothed as much as possible with the finest grade of carborundum, diamantine is used. Moll recommends using one side of the plate for grinding and the other for polishing the edge. To grind into shape the edge of the knife or razor as furnished by the manufacturer is a matter of considerable difficulty, and here in particular carborundum or is almost indispensable. Those possessing microtomes in which razors can be clamped will probably find it more convenient to obtain thick razors already ground to shape and with the superfluous part of the cutting edge removed, as advocated by Moll. Such razors, of good English manufacture, slightly hollow-ground, and having a cutting edge measuring about 14–16 degrees, are sold by P. J. Kipp & Zonen, Delft, Holland, for $2.50. A glass plate mounted on a wooden block for for sharpening the same can be had for $1.25. These razors are rigid, in this respect very different from the thin, very hollow-ground ones usually found on the market. They have an anvantage over knixes in being more easily handled, besides being ceeaper and easier to protect from injury when not in use.—W. T. Swingle in Science.

THE MICROSCOPE.

Contents for Aug., 1897.

BACK NUMBERS WANTED.

There are several Libraries and subscribers who have written for back numbers of THE MICROSCOPE which are exhausted. For any five of the following, we will give a year's subscription :

1881, June, Aug., Oct. 1882, Apr., Dec. 1883, Apr., June, Aug. 1884, Mar., Aug., Sept., Nov. 1885, Mar., May. 1886, Jan., May, June, Aug., Sept. 1887, Aug. 1888, Feb., Apr., May, Dec. 1889, Jan. 1890, Jan., Feb. June. 1891, Jan., July, Aug., Nov. 1892, Feb.

THE MICROSCOPICAL JOURNAL.

Contents for Aug., 1897.

THE MICROSCOPE

SEPTEMBER, 1897.

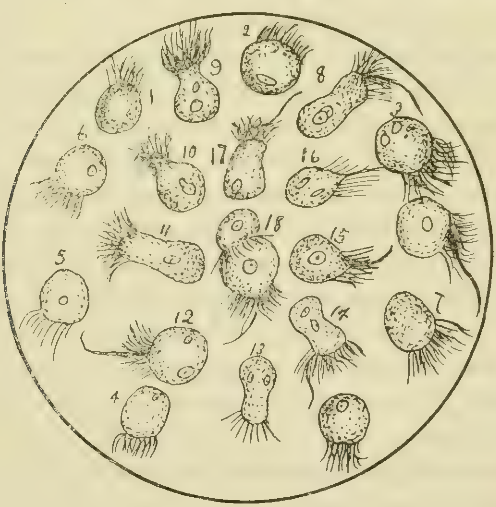
NUMBER 57 NEW SERIES

Epidemic Influenza.

BY A. T. CUZNER, M. D.,

GILMORE, FLA.

During the year 1882, while engaged in certain microscopical investigations for Prof. John Phin, editor of the "American Journal of Microscopy," I was requested by



him to call on Dr. Ephraim Cutter, of New York, and examine some specimens of rhizopods which the doctor claimed to be the cause of "Epidemic Influenza." It was thought Dr. Cutter might possibly have mistaken ciliated epithelium for the forms he claimed to have found in the

discharge accompanying the diseases, although "asthmatus ciliaris" (the name given the forms) was admitted in Kent's Manual of Infusoria.

His son was then suffering with the disease and I examined specimens of mucus from his nasal passages, using for this purpose a one-fifth objective. For the first time I saw the "asthmatus ciliaris." They could not be mistaken for ciliated epithelium. I carried away some of the mucus in a small vial keeping the specimens next my skin for warmth. A low temperature is fatal to the forms. About six months after, I suffered from what appeared to be a coryza or cold in the head. After some days, I examined some mucus discharged, and found a number of living asthmati in active motion, rocking from side to side and gracefully waving their cilia. I have had this complaint four times since and each time have found the same living organisms.

During the yellow fever epidemic of 1888, one of the foreign physicians (a Cuban) called with me to see a patient suffering from yellow fever and who had black vomit. I carried my microscope with me and while examining some urine for casts, noticed the doctor was suffering from influenza. Obtaining some mucus from his nasal passages, I placed it on a slide under the objective and we both plainly saw the living forms of asthmatus.

Infusorial catarrh is purely a parasitic disease, arising from a peculiar animalcular organism armed upon one side with cilia. This organism assumes a great variety of shapes and sizes.

By watching its development and metamorphosis under the microscope, it may be seen to transform itself into all the different forms represented in figures from 1 to17.

The most usual shapes appear to be either spherical or oval, as seen in figures 1 to 8. Each frequently sends out a probosis, at the end of which is an elongated and dilated cilium, as represented at 14, 15, 16 and 17.

This probosis may be in the center of the mass of cilia as at 15 or 16, or at the side, as at 14 and 17. It may be drawn in, leaving a nipple-like elevation, as at 10, or it may disappear entirely, leaving the organism oval, as at 8, or spherical, as at 6.

The proboscis often only partially disappears, or is partially drawn in, while a constriction occurs in the form, as represented at 13 and 14. It may be simply a largely dilated cilium, as at 17 and 18, or the cell walls may go out, forming a more or less sharp protuberance, as at 15; or the walls may go still farther out, forming a more or less fusiform organism, as at 16.

The young are developed within the parent cell, and when mature are discharged at the end of the organism opposite the cilia,as seen at figure 18. The parent becomes quite dilated before delivering, and as the young one is discharged the parent cell becomes shrunken and shriveled for a time. The aperture, however, soon closes; the wrinkled, shriveled condition of the walls disappears, and the parasite moves about again, fresh, plump and as lively as ever.

The cilia are in active motion during the greater part of the life-existence of the parasite, and produce a most aggravating irritation of the mucous surfaces. The young organisms—1, 2, 3, 4, 5 and 6— have a rolling, rocking, vibrating motion from side to side, making about one-third of a revolution on the transverse axis at each oscillation. The more mature cells either vibrate slightly or have a tremulous motion, the cilia not moving altogether as at 5, but vibrating in different directions.

After once obtaining a foothold on the mucous surfaces of the air passages, they multiply rapidly. At first they attack the mucous surfaces of the eye and nose, causing free secretion of tears and thin mucus, and often intense paroxysms of sneezing.

The organisms gradually travel from the nasal surfaces

down into the fauces, larynx, trachea and larger and smaller bronchi. As soon as they reach the fauces there is a burning heat and irritation in the parts that excite severe coughing.

If the parasite makes its way into the smaller bronchi and air cells, asthmatic symptoms of a distressing character often supervene.

The cough is short and somewhat painful, and the invaded surfaces feel irritated and hot. The cough raises but a small quantity at a time and relieves the irritation and itching but a few moments. Whenever the parasites are developing rapidly on the velum palati, most intense paroxysms of coughing are excited, which are long, persistent and painful, and sometimes are accompanied by severe spasms of the epiglottis. Often an irritation and itching will be felt on one side of the throat only, exciting constant desire to cough.

This disease belongs to those that may be transmitted from one individual to another, though the transmission is not very readily accomplished. In working very closely over about sixty cases of the disease, examining the sputa under the microscope for many hours together in each instance, and in several severe attacks devoting days to the examination, Dr. Salisbury took the disease six times and in two instances transmitted it to his family.

He usually began to feel symptoms of the presence of the parasites in from four to eight days after beginning to treat a case, taking the precaution to inhale a solution of crystallized carbolic acid, one drachm to the pint of water, every two or three hours, and to take twenty drops of tincture ferri-chloride in a tumbler of water two hours after each meal.

I have found inhalation of menthol and camphor and at times a saturated solution of benzoate of soda used with a nebulizer would do the most good, while the men-

thol succeeded better at others. The inhalations are very destructive to the parasites.

If the sputa is examined before the first inhalation, and then again after it, a remarkable difference will be observed in the condition of the parasites. Before inhalation they are in active motion; after it, if thoroughly done, they will nearly all be found either dead or motionless. By inhaling at short intervals and thoroughly, one leaves no chance for the parasites to get numerous; and soon the follicles become permeated with the inhaled material and the exciting cause is destroyed.

In addition to the local application a cure is much more speedily accomplished if a general treatment is instituted looking to an improvement of the general health, Tonic medicines, such as quinine arseniate, phosphate of iron, etc., etc., should be used.

Many of these attacks may be aborted in twenty-four hours, if the nature of the disease is promptly recognized and is properly treated. If the disease be not recognized and is allowed to run its course unchecked, the treatment being applied to the accompanying symptoms and lesions, it will last a month. Sometimes these infusorial organisms invade the vesicles of the lungs, producing an inflammatory action there. This disease becomes epidemic at certain times and seasons, being doubtless favored by certain conditions of the atmosphere, while it is capable of being spread abroad at any time by the breath and the secretion of the afflicted individuals. I have had the disease myself during mid-summer. It is most prevalent, however, during the spring and fall months. Cold is very destructive to the parasites.

Cats.—A new element has been introduced into the problem of the origin of our cats by the discovery in Brazil of a tortoise-shell wild cat, of which the late Professor Cope had the only known museum specimen.

Some Moulds and Bacteria Found in Medicinal Solutions.

BY SMITH ELY JELLIFFE.

Every observant pharmacist knows that certain preparations which are kept on the shelves are liable to be spoiled by the development of certain moulds.

By means of a tour of inspection among some of the drug stores of the city, and with the generous help of the postgraduate class of the College of Pharmacy of the City of New York, a number of specimens of moulds were obtained.

As culture media the ordinary bacterial media were used. In general four or five media only were used; those were nutrient gelatin; nutrient gelatin plus two per cent of glucose; nutrient agar, nutrient glycerin agar and nutrient potato agar.

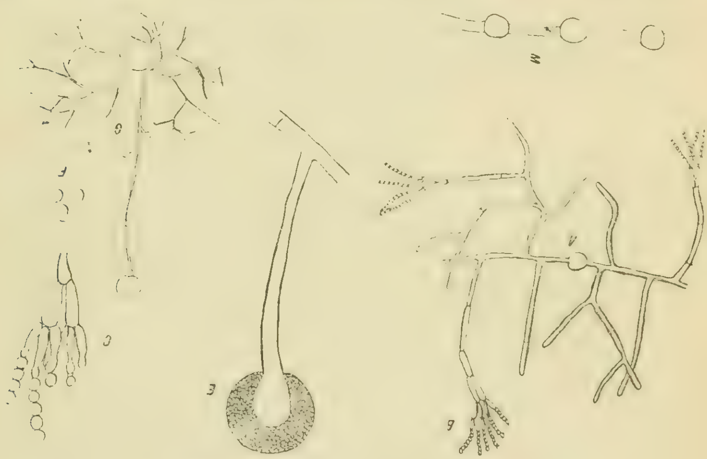
This potato agar and the gelatin agar gave the most rapid and characteristic growths.

In order to get pure cultures of the moulds, the regular bacterial method of dilution was practiced. This method differentiated the moulds and yeasts quite readily, but with some it required several transplantings, sowings and fishings under the microscope to get the cultures free from bacteria. The yeasts and the bacteria were readily isolated.

The commonest mould found was Penicillium crustaceum, Lk., the Penicillium glaucum of other authors. As is well known, this mould is a common inhabitant of of mouldy bread and cheese, damp walls, closets, jams marmalades, etc. It has been found in infusion of wild cherry bark, compound syrup of the hypo-phosphites, solutions of quinine, morphine, homatrophine, cocaine, and a number of other preparations. Its description is as follows :

Starting from the spores, which are small, averaging 3 to 4 microns, the mycelium soon branches, and by the

end of 48 hours forms a rich felt of fine whitish threads. On gelatin in Petri dishes, at the room temperature 18-20° C. in three days the mycelial growth may be 2 to 3 cm. across, and the spores commence to be formed. These are borne on ascending branches, which are septate, and at the ends branch quite richly. On the ends of the branches chains of small, circular or slightly oval spores are borne, sometimes as many as thirty in a chain; the spores are smooth, light-greenish in color, and give to the mould a distinct bluish-green color when sufficiently



Explanation of the Figures.

a, Spore with Mycelium filaments (Penicillium crustaceum). b, Spore cluster (schematic.) c, Sterigma. d, Spore. e, Spore head of Mucor racemosus with spores within. f, Spores. g, Schematic representation of mycelium and spore case with secondary branches. h, Chlamydospores on mycelium.

numerous, which gave the name glaucum to the species.

In some medicinal solutions especially those with small percentage of sugar, this mould grows luxuriantly, destroying the solution both from a pharmaceutical as well as medicinal standpoint.

The organism next in frequence was a mucor—Mucor

racemosus, Fres. This grows exactly like the Penicillium as far as its vegetative part, the mycelium, is concerned. It is whiter and more fluffy, however, when grown on artificial media, and in 36 to 48 hours sends up its fertile branches. These are erect, non-divided, and bear at the apex a round smooth head 50 microns in diameter. In this head there are hosts of spores, which are spherical smooth, light to fawn color, 4 to 6 microns in diameter. In Petri dishes these heads are borne on branches sometimes 1 cm. high. The fertile branches also have short side branches. This is one of the characteristic features of this mucor. At maturity the whole plant is tawny-white in color; the spore case breaks, but does not disappear or deliquesce as it does in many similar species.

In most media the formation of swollen cells on the mycellium is to be noted; these are the "chlamydo spores," more or less characteristic of this species.

This plant produces a great deal of havoc in all solutions containing sugars or glucosides, and even in alkaloid solutions. It ferments the sugars and glucosides, and if there is anything organic other than the alkaloid to break up it seems to attack it, and thereby destroy the alkaloid. Solutions of morphine and cocaine inoculated with this organism failed to give the characteristic color reaction after three weeks. Further investigation along this line is in progress in the laboratory.-Drug Cir.

The use of the Thyroid Gland in Medicine is of special and peculiar interest because, instead of having been deduced empirically like most other features in medical practice, it has been adopted as a logical conclusion from adequate premises.

THE MICROSCOPE.

New Series, 1893.

***For Naturalists**, Physicians, and Druggists, and Designed to Popularize Microscopy.*

Published monthly. Price $1.00 per annum. Subscriptions should end with the year. The old series, consisting of 12 volumes (1881–1892), ended with December, 1892. Sets of the old series cannot be furnished. All correspondence, exchanges, and books for notice should be addressed to the Microscopical Publishing Co., Washington, D. C., U. S. A.

CHARLES W. SMILEY, A. M., EDITOR.

EDITORIAL.

The Pharmacist as a Bacteriologist.— It is thought that there is a larger field of usefulness coming before the profession of pharmacy. Bacteriological work is not for the practicing medical man. It is work for which the training and education of the pharmacist particularly fits him. There is no reason why he should not prepare remedies from bacterial cultures as well as from the barks of trees or from the bodies of animals, or why he should not examine water for typhoid bacilli as well as a stomach for arsenic. In order to take up this work the pharmacist of the future must be more of a biologist than in the past; he must not only look to the test-tube, but also use the living tissues as his reagents.

To his work in the future we may look for the provision of aecurate remedies of definite power with which to cure or prevent disease, and convert the art of medicine into the science of therapeutics.

Attention has been specially drawn to this subject in an address before the Manchester, England, Pharmaceutical Association by Dr. Robert B. Wild.

Health of the Jews.—The marked immunity from disease of the Jews is noted. It has continued even to the present day, as evinced by the extremely low mortality. This

condition of affairs is attributed to the rigid enforcement of the laws of health prescribed by the Hebraic law, and also to the racial sobriety producing a sturdy constitution, capable of resisting disease to a considerable degree.

Seeds as Objects.— Science-Gossip suggests making slides of the common garden seeds and says that foxglove, mignonette, petunia, larkspur and bartonia are especially interesting and beautiful. To kill the attached fungi or insect ova, subject the seeds to 200 F. of heat. Mount as usual.

PRACTICAL SUGGESTIONS.

BY L. A. WILLSON,

CLEVELAND, OHIO.

Preparation of Marine Animals.—These forms should be freed from sea water before treating them with either alcohol or any fixing reagent that precipitates the salts of sea water. Fixing solutions for these animals should never be made with sea water as a menstrum. If alcohol be employed it should be acidified.

Penicillium Cupricum.—Mr. J. de Seynes states that the fungus called by this name is but a form of P. glaucum the ordinary appearance of which it assumes when transferred to a different medium.

Cyclops Quadricornis.—This little animal is found in lakes, ponds and streams. When gathered in a transparent vessel it may easily be detected as little white specks darting from side to side with a peculiar jerking motion. To examine it alive, dip out a specimen with a table-spoon. If possible obtain a female with her extended egg-bags. Such a female may be known by the egg-bags on each side of her body. Remove most of the water from the spoon with a medicine dropper; then transfer the cyclops with a drop of water to a slide with a cell. Fill the cell full of water, cover and examine with a one inch or three-quarter inch objective. The specimen will be worth the trouble

when examined by any of the various illuminations. It is especially handsome when exhibited with the aid of a paraboloid. This animal is the principal food of the white fish of the Great Lakes.

How to see the Spores of Hypoxylon.—These plants belong to the pyrenomycetes and are frequently found on bark and rotten wood. Covering the bark will be seen strange growths dotted with the ostioles. No rule will universally apply to them. Often by lifting this papery or coriaceous growth, little round prominences will readily be seen on the under side. Place one of the latter in a drop of water on a slide, mash with a spatula cover and examine with an objective equal to a quarter. The spores of different species are of various shapes and sizes and often with markings and of every grade of coloring. The strange growths on the bark are stromas and the prominences on the under side are the perithecia.

QUESTIONS ANSWERED.

NOTE.—*Dr. S. G. Shanks, of Albany, N. Y., kindly consents to receive all sorts of questions relating to microscopy, whether asked by professionals or amateurs. Persons of all grades of experience, from the beginner upward, are welcome to the benefits of this department. The questions are numbered for future reference.*

Q. 253.—Who first conceived the science of bacteriology?

Research through a long period of time, prior to the microscopic discovery of bacteria, has brought upon record as the originator of germ theories of disease, one Francisco Redi, who was born in 1626. It is also an interesting thing to note that Aly Pasha, who was, in the beginning of this century, Governor of Jamaica, once remarked at that time of a local scientist:—"Would you believe it? He pretends that the plague is composed of a vast number of minute animalcules, which would be visible through a magnifying glass if one could be procured of sufficient power."—Science Siftings.

Q. 254.—What is the address of Edward Potts?

A. 228 South 3d st., Philadelphia, Pa.

SCIENCE-GOSSIP.

Staining Tubercle Bacilli. -The method first proposed by Glorieux is the most rapid, and a very slight modification of it makes it one of the best.—

It is as follows:

Fuchsin stain (Neelson's modification.)

Fuchsin	1 part.
Absolute alcohol	10 parts.
Crystallized carbolic acid	5 parts.
Water, distilled	100 parts.

Dissolve the fuchsin in the alcohol, add the carbolic acid, and finally the water.

The blue stain is so constructed that it obviates the old bleaching solution of the earlier methods. It is made thus:

Absolute alcohol	10 parts.
Sulphuric acid, c. p	15 parts.
Water, distilled	50 parts.
Methyl blue, sufficient.	

Mix the acid and water, and after the mixture cools down, add the alcohol. Now add methyl blue until it no longer dissolves (i. e., to saturation) and filter. The object to be stained is left in the fuchsin for thirty seconds, and is thence removed directly into the blue stain where it is left until the red tint is removed, or from 30 to 60 seconds. —National Druggist.

RECENT PUBLICATIONS.

Current Literature for August has portraits and a highly interesting notice of the three Darwins—Charles, the greatest scientist of the Victorian era, his grandfather Erasmus, the great physiologist, and George Darwin, second son of Charles, foremost authority in the study of tides, and on the wonderful astronomical theory of Tidal Frictions.

Foramenifera.—In the current number of Revista Italiana di Paleontologia Dr. C. Fornasini summarizes the contents of several recent writing on the Rhizopods.

THE MICROSCOPE.

Contents for Sept., 1897.

BACK NUMBERS WANTED.

There are several Libraries and subscribers who have written for back numbers of THE MICROSCOPE which are exhausted. For any five of the following, we will give a year's subscription :

1881, June, Aug., Oct. 1882, Apr., Dec. 1883, Apr., June. Aug. 1884, Mar., Aug., Sept., Nov. 1885, Mar., May. 1886, Jan., May, June, Aug., Sept. 1887, Aug. 1888, Feb., Apr., May, Dec. 1889, Jan. 1890, Jan., Feb. June. 1891, Jan., July, Aug., Nov. 1892, Feb.

THE MICROSCOPICAL JOURNAL.

Contents for Sept., 1897.

THE MICROSCOPE

OCTOBER, 1897.

NUMBER 58 NEW SERIES

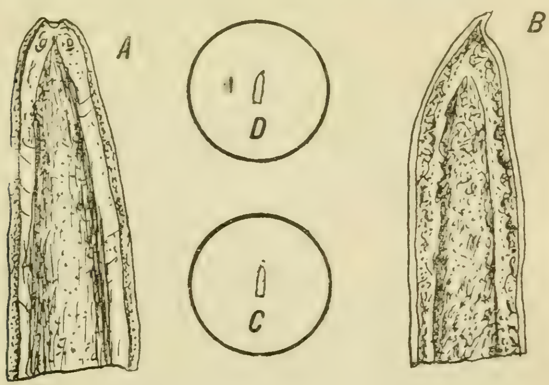
A Curious Nematoid Parasite.

BY OLIVER COLLETT,

CEYLON.

In the stomach of an insect, Mantis religiosa, was found a curious parasite of remarkable length.

The female Mantis from which the parasite was taken was nearly full grown. It measured $2\frac{3}{4}$ inches in length from front of head to tip of tail, and four inches in breadth across the outstretched wing-cases. Its abdomen



measured one inch long and half an inch in width. It seems incredible then that in the stomach of this insect there should have lived a parasitic worm measuring one-thirtieth of an inch in diameter and no less than two feet three and a half inches in length. Indeed, the length of the parasite was equal to almost twelve times that of the entire body of its host.

The animal is an aproctous nematode of the family Mermithidia. It may be described as follows :—

The body : long, smooth, and cylindrical, narrowed at the anterior end; the other extremity being slightly flattened, and ending in a short, curved point : color opaque milky white, changing to bright yellow at the tail.

Skin : smooth and shiny; the ringed structure of the cuticle, which often occurs in species of this kind, is very apparent when the animal is mounted in balsam. The skin was covered with a thin coat of transparent mucus. This, however, was unfortunately destroyed by the action of the Formalin solution in which I at first attempted to preserve the specimen, so that no trace of it now remains.

Beneath the skin lie two or three layers of longitudinal muscular fibre, also the usual inner circular series of the same. These enabled the animal to increase or shorten its length considerably, its body after death measuring nearly two inches longer than while it was alive.

The body is hollow, furnished with one pore at the anterior end. This represents the mouth, which is simple and unarmed. Below the mouth lie four oval papillæ, a. By means of these the animal clings on to its host during its parasitic life, and they afterwards serve as organs of sexual attachment when the animal gets free.

The mouth appears to lead immediately into a long intestinal canal, which runs through the entire length of the body, and has no anal opening. At a point just above the tip of the tail, b, is the outlet of the excretory canals. There canals run back one on each side of the intestinal canal for a considerable distance.

The animal has no circulating apparatus. The figure represents the appearance of the extremities of the animal magnified 200 times under the microscope, after they had been rendered partly transparent by glycerine, etc.

Mr. Haly, Director of the Colombo Museum, to which the specimen has been sent, is of opinion that the anim a

is one of those which, according to Claus, live in the body cavity of insects, finally escaping into damp earth, where they attain maturity and breed.

Some Cryptogams.

[From the Pharmaceutical Journal.]

If you have a microscope you will find the study of cryptogams very interesting, and will have no difficulty in obtaining plenty of material suitable for study. The

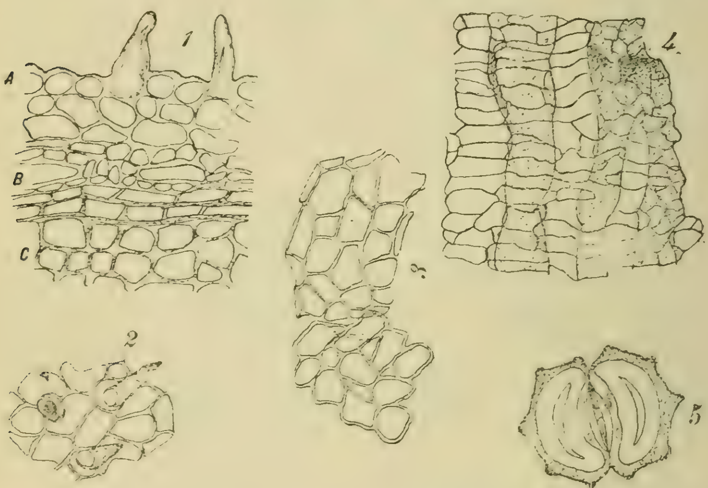
mode of reproduction by gemmæ is here illustrated by sketches of some interesting specimens. Amongst mosses, Aulacomnion audrogynum may be found (fig. 1). The cut shows plant in fruit, a , gemmæ, b ; and same magnified, c. It grows on shady banks and rocks. The fruit is ripe in May or June.

Of the Hepatticæ a number of species are obtainable. Very widely distributed is the liverwort, Lunnaria vulgaris, (fig. 2) and scale moss, Kantia trichomanis (fig. 3), both of which grow on damp banks, rocks, and on flower pots in green houses, In the case of the liver-wort, the gemmæ are borne in semi-circular cups on the fronds. In fig. 2 the fruit is shown, d ; the frond bearing gemmæ, f.

Those who wish assistance in studying cryptogams could write the professor of botany in the nearest college or in fact to any large college enclosing stamp for reply and furnishing specimens of plants.

Structural Characteristics of Some Important Drugs.

ANISI FRUCTUR.—The structure of anise fruit resembles that of dill and other umbelliferous fruits, but the numerous short cone-shaped hairs developed from the



EXPLANATION OF THE FIGURES.

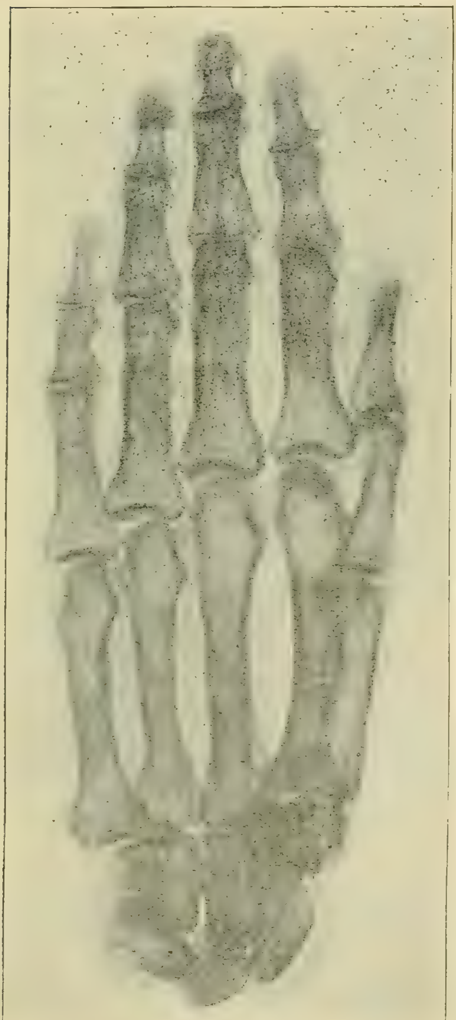
1. Transverse section through pericarp and seed-coat; a, epidermis; b, vitta; c, endodermis. 2. Portion of epidermis, showing hairs and stomata. 3. Two layers of parenchyma from seed-coat. 4. Vittæ as seen in longitudinal section. 5. Transverse section.

epidermal layer are very characteristic, as are also the usually numerous vittæ. Of these there are from sixteen to thirty in each mericarp, the largest occurring in the commissure. A further noteworthy peculiarity is the thickening of the seed coat at the commissure.

The powder is greenish-brown, with characteristic odor and taste. In it may be distinguished the short, conical, unicellular hairs, either isolated or attached to fragments of the epidermal layers, fragments of the parenchyma, sclerenchymatous cells, and portions of vascular bundles from the pericarp; and small pieces of seed-coat and endosperm together with cluster crystals of calcium oxlate and aleurone grains from the cells

the latter. Traces of the vittæ appear in small particles and, even in fine powder, fragments may sometimes be-found in which two or more oil receptacles are united.

Hand of an Egyptian Mummy Two Thousand Years Old.

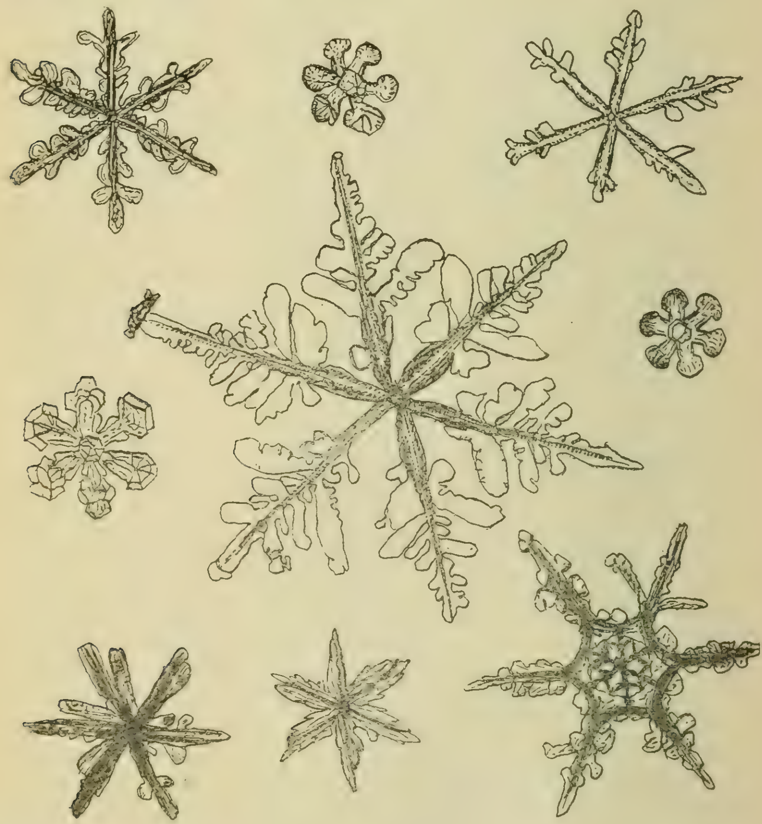


This was photographed by means of the wonderful X rays directly through the cloth and spices in which the hand was wrapped. The work was done by W. Watson & Son, 313 High Holborn, London, England who will send a catalogue of their microscopic and X ray apparatus to any one mentioning this magazine as the place where the offer was seen. Postage to England is five cents on letters and two cents on postals.

The Watsons have over 50,000 objects in stock and they can be sent into this country free of duty.

Snow Crystals.

Crystalization though sometimes attaining size to be recognized by the naked eye more often lurks out of sight and the glass is needed to reveal its beauties. Every one can have access to snow in its season and can examine its beautiful crystals.



They belong to the hexagonal system (six-sided) the basis of every figure being a hexagon of six rays.

These rays, however, become incrusted with an endless variety of secondary formations of the same kind, some consisting of thin laminae (plates) alone, others of solid

but translucent prisms heaped one upon another. Still others combine laminae and prisms in rich profusion the angles by which these figures are bounded being invariably 60° or 120°. Beautiful arborescent forms are not unfrequently produced by the peculiar mode of aggregation of individual crystals. Of these a frosted window gives an example.

A splendid little microscope suitable for seeing these and many such things is now made by the greatest optical house in America and furnished by us together with a year's subscription for $2.50. Or we will give one absolutely free to a new subscriber to the Journal and Microscope at $3.50 per year.

Inclusions.

By W. S. BEEKMAN,

WEST MEDFORD, MASS.

Inclusions are of many kinds. The life within a gall may be studied as such. The interesting internal crystalizations, known as raphides, are inclusions with a great variety of characteristics. In a recent article attention was called to the beautiful Marcassite which may be seen enclosed within a crystalline coffin of delicately tinted Calcite. The Calcite is of a fascinating transparency; only the products of "Nature's Laboratory Creations," present such exquisitely finished forms. Not but what the forces which operate in the chemist's laboratory are identical with the forces which so mysteriously guide the instantaneous movement of the great army of molecules which rear the edifice. The difference is in the matter acting and acted upon. There seems to be greater refinement of the more stable forms which are the permanent results from many subtle changes. It is Ruskin who has grandly suggested, that the final results which seem to be ever the idea of greatest importance in

Nature's complex changes, are the production of imperishable combinations. He says "the laws of Nature which never fail, and to which all change is subordinate, appear such as to accomplish a gradual advance to lovelier order, and more deeply seated rest."

Speaking of the changes possible to dust, he again writes: "For, through the phases of its transition and dissolution, there seems to be a continual effort to raise itself into a higher state; and a measured gain, through the fierce revulsion and slow renewal of the earth's frame, in beauty, order, and permanence."

That one will often find within a crystal, some foreign inclusion that has a movement, and which may be even a liquid substance, is a well known fact. The importance of temperature, however, is not enough taken into consideration, and many fascinating phenomena are so lost.

One day it was my good luck to become an owner of a beautiful coerulean blue sapphire—a gem of nine carats weight. It presented a wonderful combination of the lightest metal in the commercial world, with an invisible gas; which is so necessary and so pathetically deficient in the average sleeping chamber. That two such wonderfully endowed substances should enter into an embrace which would evolve next to hardest, and next to the loveliest thing in the world, is astonishing. Because there happened to be a flaw within the crystalline confines of this gem, its value as a cabinet specimen was not the least bit impaired.

One bright cold morning I happened to take the stone in hand, and for the first time saw a moving bubble inside the flaw. I was at that time hunting quartz crystals for bubbles, and this discovery pleased me very much. I made an immediate start for a friend, to show him my new treasure. But after a careful examination of the gem, even to the trial of polarized-light, not even a trace of a bubble could be seen.

Home again, I searched into the depths of the transparent jewel, but with no success. Such close scrutiny of the flaw made it seem larger, and I tried to reason that the bubble, which had certainly moved before my eyes, had in some way worked out of the stone. After supper, I resumed the inspection of the gem. Placing it in the forceps, turning on the light, and then giving the holder just a little turn there was my itinerant bubble again. The bubble was falling to pieces; and in a few moments it had entirely disappeared. At a temperature between 29.5° and 30° C., the bubble changed from a liquid to an invisible gas. This is the critical point of liquified Carbonic acid when under a pressure of 90 atmospheres. The sapphire is born among the old formations within the crust of the earth; and with this revelation we feel sure of many more points concerning the early life of a sapphire, through induction.

Black Plague in China.—Jansen states that this disease is caused by a specific bacillus and that this organism occurs in dead rats and mice found in pest houses, also bogs. That Chinese should be affected with this terrible plague is not strange, since in many houses bogs form part of the household. Pigeons are immune.

Kitusuta states that inasmuch as the general symptoms of the disease resemble those of anthrax, it is possible to distinguish it only by making a bacteriological examination (Centralblatt. Bakt. u Parasitenk. xix; Abth I 974.)

Yellow Fever Microbes.— Dr. Havelburg announces that the microbe which he considers the specific cause of yellow fever is found only in the stomach and intestines, but is cultivated by injecting it subcutaneously into guinea pigs. He finds that a previous injection of blood from a yellow fever convalescent renders an animal immune to an otherwise fatal dose of injection of the cultivated microbe. | O Brazil Medico.

THE MICROSCOPE.

New Series, 1893.

For Naturalists, Physicians, and Druggists, and Designed to Popularize Microscopy.

Published monthly. Price $1.00 per annum. Subscriptions should end with the year. The old series, consisting of 12 volumes (1881–1892), ended with December, 1892 Sets of the old series cannot be furnished. All correspondence, exchanges, and books for notice should be addressed to the Microscopical Publishing Co., Washington, D. C., U. S. A.

CHARLES W. SMILEY, A. M., EDITOR.

EDITORIAL.

Tuberculosis in Goats.—From the following it will be seen that the hitherto accepted theory that goats are immune to tuberculosis is not altogether correct. Bulling (Indian Medical Record) records a case of pulmonary tuberculosis in a goat. Both lungs were adherent, and large and small tuberculous foci were present. The author concludes that it would be well to examine into the possibility of the transmission of tuberculosis through the agency of goats, and to consume their milk only after boiling, or after the goat has been shown to be free from tuberculosis by the absence of reaction after the injection of tuberculin.

Preservation of Water Mites.—Glycerine and Wickersheim's fluid, one and a-half ounces of each, and distilled water, three ounces, the whole to be shaken and thoroughly mixed, and added to thirty ounces of ninety-five per cent alcohol. The colors of the mites are apt to fade somewhat if exposed to light, the collections should therefore be kept in closed boxes.

Exchange.—H. W. Parritt, 8 Whitehall Park, N. Loddon, England, wishes to exchange microscopical slides, books and objects for crustaceans, echinoderms, sponges, zoophytes, shells and other marine objects, fresh or dried.

QUESTIONS ANSWERED.

Note.—*Dr. S. G. Shanks, of Albany, N. Y., kindly consents to receive all sorts of questions relating to microscopy, whether asked by professionals or amateurs. Persons of all grades of experience, from the beginner upward, are welcome to the benefits of this department. The questions are numbered for future reference.*

Q, 260.—*What is the best method of preparing and treating soft or hard vegetable substances for cutting and mounting.* J. H. T.

A.—Soft or growing vegetable material should be cut into half-inch lengths, or smaller and placed in three or four times the bulk of strong alcohol. After 24 hours, pour away the weakened liquid and replace with strong alcohol. Repeat this three times. The specimens will then be hardened and ready for cutting. Many stems, leaves and roots can be supported in a piece of carrot, suitably shaped or hollowed, and cut with a razor, flooded with water or weak alcohol, so the section will float when cut. Buds, ovaries and other structures, with loose internal parts must be embedded (in celloidin by preference) before cutting. Hard and dry woods can be sectioned with a sharp, finely-set plane.

Q. 261.—*Is there any book of a moderate price that fully treats the subject of vegetable sections?* J. H. T.

A.—Clark's Practical Methods in Microscopy, costs $1.50, is a good book. See American Monthly Microscopical Journal, Vol. VII (1886) page 43, for a valuable article on staining vegetable tissues; also Vol. XII (1890) page 190, on preparation of vegetable tissues.

PRACTICAL SUGGESTIONS.

By L. A. WILLSON,

CLEVELAND, OHIO.

Palidium Ciliare.—There is a liver-moss found on rotten logs and stumps. Generic name means a feather, alluding to the fringed foliage. Mounted in glycerine gelly it is

a star specimen for a cabinet. Exhibited with an inch objective it will excite wonder that so small a plant can be so beautiful and so complicated.

Circulation of Blood.—Most books recommend the use of a frog's foot for this purpose and give directions for accomplishing the purpose. The object may easily be attained with a small tadpole, lizzard, and with many of the larger water larvae. The latter will show the circulation all through the body. With the lizzard and tadpole, it may best be seen in the thin membranes of their tails. All that is necessary is to place the animal in a glass slip with a shallow cell and cover it.

Opaque Objects.—The writer has known of amateurs who possessed microscopes for a long time before learning how to examine opaque objects. The specimen should have a dark ground, or if mounted transparent, an opaque slip, a piece of dark card board, or any other suitable thing to keep the light from below. Then, if the mirror swings above the stage, use that turning the concave mirror. The students' lamp should be raised above the stage and the lamp placed directly in front of it. Throw a bright spot on the object so that it will illuminate the part of the object focussed. If the mirror does not swing above the stage, a bull's-eye condenser must be used to illuminate the object.

SCIENCE-GOSSIP.

Examination of Milk.—Dr. William Royal Stokes, bacteriologist to the health board of Baltimore, used the following in the municipal laboratory in examining milk. When the milk examined is from one cow, or even when it is a mixed milk from many cows, it is centrifugalized for some minutes and then the sediment is spread out on a glass and stained. If many pus cells are found the specimen is rejected; but if there are only one or two pus cells in the field the specimen is passed.

THE MICROSCOPE

NOVEMBER, 1897.

NUMBER 59 NEW SERIES

A New Microtome.

BY SIDNEY YANKAUER, M. D.
NEW YORK CITY.

The instrument consists of two parts, a stand and a movable right-angled piece. The stand consists of a triangular piece of metal across the base of which an oblong piece of plate glass is fixed. At the apex of the triangle, a, is a small elevation, at the summit of which is a small hole $\frac{1}{8}$ inch in diameter and $\frac{1}{8}$ inch deep. The bottom of this hole is on a level with the glass plate, so that if the surface of the latter were prolonged into a plane, this plane would just touch the bottom of the hole.

Near the glass plate a vertical rod is inserted which can be fixed in any desired position by a set screw; to the top of this rod the specimen holder is fixed.

The sliding piece consists of a piece of metal bent into a right angle, e, f, g. One arm is about 7½ inches long, the other is 12½ inches long. The angle and both ends of this sliding piece are perforated by screws which are pointed at the ends and capped by small spheres. These screws are interchangeable.

The sphere on the screw point, at e, fits exactly into the hole at the apex of the stand, the top of this screw carries a circular plate divided into one hundred parts by a scale. This is the micrometer screw. All the screws are large, having only ten turns to the inch. The blade, fig. 1, h, is fastened to the long arm by the thumb-screw, t, at

a distance from the short arm equal to one-fifth the length of the long arm. The blade is so secured in its socket that its edge is parallel to a line joining the points of the screws on the short arm, f and g.

The sliding-piece moves along the glass plate carrying the knife over the specimen to be cut. By rotating

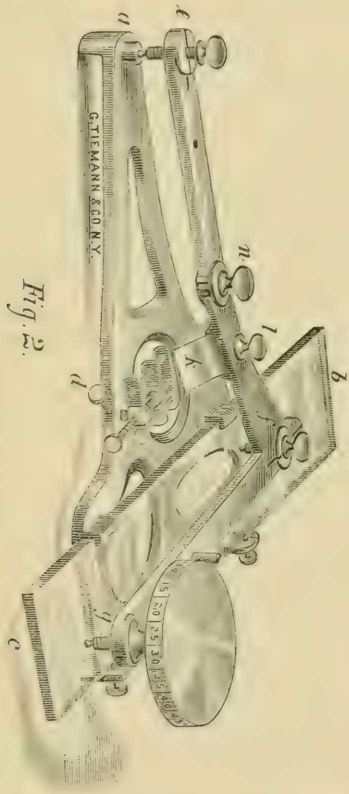


Fig. 2.

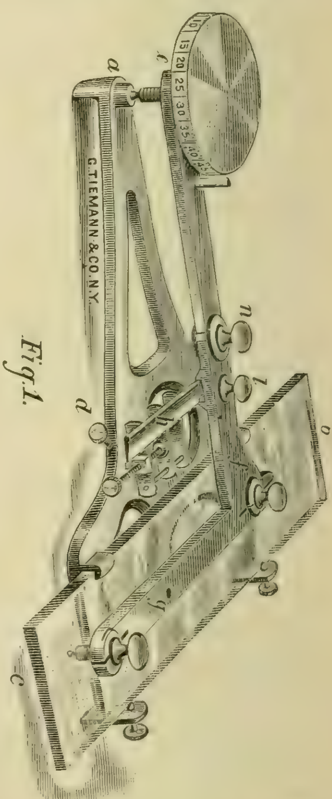


Fig. 1.

the micrometer screw after the sliding piece has been returned to its original position, the long arm of the latter, and with it, the knife are lowered; when the knife is again carried across the specimen a section is cut, the thickness of which is measured as follows: a complete revolution of the micrometer-screw lowers the end fig. 1, e,

of the long arm of the sliding piece, 1-10 inch; the position of the screws at f, and g, is not altered; as the distance between the knife and the short arm is one-fifth the length of e, f, the knife is lowered 1-50 inch for a complete revolution. The micrometer plate has one hundred divisions hence each division represents a lowering of the knife of 1-5000 inch, or five micro-millimeters. By bending the long bar at the joint, n, the knife can be placed in position to cut specimens of a diameter of from $\frac{1}{2}$ inch to the largest that can be clamped in an ordinary specimen clamp.

As the knife is so fixed in its socket that its edge is parallel to a line joining the points of the screws, fig. 1, f and g, and as these points rest on the plane of the glass, the edge of the knife must be parallel to the plane of the glass. This is true, whatever be the distance of the end fig. 1, e, of the long arm from the point of the micrometer-screw. Furthermore as long as the micrometer-screw is in a given position in its thread, the distance of the knife from the plane of the glass is constant. Hence in successive motions of the sliding-piece across the glass plate, the edge of the knife describes successive planes each of which is parallel to the plane of the glass. The sections are therefore included between parallel planes; hence they are of even thickness and not wedge-shaped, as might be supposed.

Of course with each alteration of the position of the knife, the degree by which it is tilted towards the plane of the glass, is altered; but the edge must remain parallel to this plane because it remains parallel to the line of the screw-points at f and g. The knife is tilted to such a degree that in no position of the instrument does its lower surface become parallel to the upper surface of the specimen.

For cutting frozen specimens, or specimens embedded in paraffin the edge of the knife must be placed perpen-

dicular to the direction of the motion. Hence a small blade has been provided which can be secured in the same socket as the larger one. See k, fig. 2. As those two screws which are parallel to the edge of the blade must be fixed, while the opposite one is the micrometer screw, the position of the screws must now be arranged as in fig. 2.

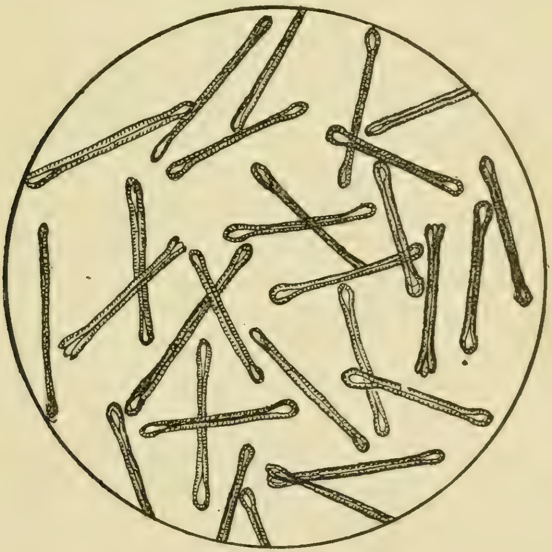
With this instrument celloidine sections can be cut as thin as ten micromillimeters and paraffin sections as thin as three micromillimeters. In fact the thinness is limited only by factors which apply to any microtome, namely, the sharpness of the knife and the quality of the specimen.

The practical advantages of the instrument over other microtomes result from its mathematical construction. Theoretically the entire motion is determined by three points, the smallest number which can, geometrically, determine a plane. Furthermore, the knife moves one-fifth as much as the micrometer-screw; hence any error in the thread of the screw will be divided by five. While these facts may be of little value in the actual cutting of a section, they afford us a great practical advantage, namely, that the instrument depends for its accurate working more upon its inherent mathematical construction than upon the technical skill and workmanship expended in its manufacture. Hence it can be made much cheaper than the usual forms of microtome. In fact, the instrument, including both paraffin and celloidine blades, can be obtained for ten dollars of Messrs Treman & Co., of New York City, who have skillfully carried out the ideas on this instrument.

Bad Taste in Reservoir Water.

To the presence of a minute plant, a diatom in fact, is due a certain fouling of drinking water. This bad taste has nothing to do with artificial causes like drainage, sewage or contamination. It is due to the microscopical chemical constituents of the water, and the the physical conditions in which the water is placed after entering the reservoirs.

Asterionella derives its name from its form, being



a star-shaped organism usually 3- or 4-rayed. It is a vegetable growth usually called an alga.

It has a skeleton or envelope capsule of silica, or soluble silica hydrate. This particular genus has the further peculiarity of secreting a substance in the nature of an oil which possesses a taste and odor so characteristic that, for lack of a better name, is is called Asterionella flavor. It is a combination of fishy, salty and oily tastes, its odor resembling that of certain varieties of geranium.

Although some of the samples of the reservoir water contained as many as twenty million individuals to the gallon, yet it would require many hundred gallons of the water to get enough of the oily product which imparts taste and odor, to work upon in the laboratory to accurately determine its nature.

In the month of August, when the trouble was at its worst, the water had a white appearance and was filled with minute white threads. On standing, it threw down a floculent deposit of a stringy, whitish or yellowish white matter. Under the microscope, this deposit was found to consist of innumerable Asterionella matted togetehr with other diatoms strung together in threads the other diatoms, being more especially Melosira, Tabellaria and Synedra. These thread-like forms have not been noticed to produce the objectionable taste and odor secreted by the Asterionella, and, moreover, they were vastly less abundant. The water itself was colorless, the apparent color being due to the suspended organisms.

Neither can it be got rid of by filtration through paper or cotton or a thin layer of sand. Sand will arrest nearly all the Asterionella. To remove both the Asterionella and all the taste and odor arising from it, it is necessary to filter through animal charcoal or thorough a properly constructed sand filter of sufficient depth.

The most characteristic feature of the diatom is its envelope of silica. There are many other kinds of microscopic organisms represented in the different portions of the Brooklyn water supply, such as green algæ, the bluish green algæ and the fungi, Rhizopods, Rotifers, Crustaceans, etc., but none of these are characterized by the presence of silica, and do not in the same sense imperatively demand it as a constituent of their food.

So far as is known the only remedy which has proved effectual has been that of excluding the light, and converting the reservoir into a substantially subterranean

basin. The proposal to aerate the water, which was advocated last summer, was fortunately, not entertained.

Clearing of Vegetable Microscopical Sections.

By WILLIAM KIRKBY, F. L. S.

The clearing of vegetable sections prior to staining and permanently mounting for microscopical examination is a necessary, but frequently a troublesome operation, especially if starch be present in any considerable quantity. As the process which 1 have followed for over ten years has given me such uniformly good results, and as I am not aware that the exact procedure has been described by anyone else, it seems worth while publishing it in order that other microscopists may make trial of it.

Clearing agents are of two kinds, namely, those which act by virtue of their property of strongly refracting light, and those which disintegrate and dissolve the obtrusive cell-contents. To the first class belong clove oil, cedar-wood oil, cajuput oil, xylol, dammar resin, Canada balsam, glycerin, and other similar bodies; to the second class solutions of caustic potash, eau de Javelle, eau de Labarraque, phenol, chloral hydrate, etc. The usefulness of most of these substances is compartively limited, while some of them are decidedly objectionable for permanent mounts because of their energetic action upon the tissues. An efficient clearing method should ensure the thorough removal of the cell-contents, but should have a minimum effect upon the cell-walls. Without discussing the merits of each of the usual methods adopted for clearing, I may say that in my hands the process I use more nearly fulfills the above conditions than any other I have tried, the sections after treatment being obtained in a condition suitable for putting up in liquid, gelatinous, or resinous mountants.

Place the sections in a fresh clear solution of chlorin-

ated lime and allow them to remain until quite bleached, say, from two to four or five minutes; gently warm in a test tube for a few seconds, then quickly replace the solution with distilled water and boil for two or three minutes; repeat the treatment with boiling water three times; wash with a 1 per cent solution of acetic acid, and finally with cold distilled water. The sections are then quite ready for the staining operations.

Although alkaline glycerin has been recommended for several purposes in micro-technique, it does not appear to be generally known how serviceable it is as an extemporary mountant in vegetable histology. The mixture which I find excellent for general use is composed of glycerin, 2 ozs.; distilled water, 1½ oz.; solution of potash, B. P., ½ oz. This combines the restringent property of the glycerin with the clearing action of the caustic potash, and it has the great advantage that the undesirable swelling action of the potash is considerably restrained.

Toledo News.—The annual meeting of the American Microscopical society in August was poorly attended. I think the following are all the members present from out of the city:—President, E. W. Claypole, Arkon, Ohio; Treasurer; Mangus Pflaum, Pittsburg, Pa.; Henry Bausch, Rochester, N. Y.; D. S. Kellicott, Columbus, Ohio; Miss Edith Claypole, Akron, Ohio; Miss Agnes Claypole, Akron, Ohio; Dr. Chs. E. Slocum, Defiance, Ohio; Francis S. Rice, Steelton, Pa.; J. C. Smith, New Orleans, La.; Secretary Wm. C. Krauss, Buffalo, N. Y. This completes the list to the best of my recollection.

The officers of the Local Society, at present are: Dr. W. D. Steward, President; Dr. A. T. Kline, Vice-President; Dr. C. T. Whinery, Secretary; W. U. Earl, Treasurer; Dr. D. E. Haag, Dr. M. Goodwin, Dr. W. H. Snyder, Executive Committee. The meeting night is the second Thursday of each month.—D. E. Haag, M. D.

THE MICROSCOPE.

New Series, 1893.

***For Naturalists**, Physicians, and Druggists, and Designed to Popularize Microscopy.*

Published monthly.** Price $1.00 per annum. Subscriptions should end **with the year.** The old series, consisting of 12 volumes (1881–1892), ended **with December,** 1892 Sets of the old series cannot be furnished. All **correspondence**, exchanges, and books for notice should be addressed to the **Microscopical Publishing Co., Washington, D. C., U. S. A.

CHARLES W. SMILEY, A. M., EDITOR.

EDITORIAL.

Absolute dryness prevents the development of germ life.

Dulau & Co., of London, have issued an album of half tone portraits of the Collaborators of the Scientific reports of the Challenger Expedition arranged on nineteen plates. The edition is limited to 200 copies and is sold at 12s. 6 d.

Examining Malarial Blood.—In a paper published in *The Lancet* Macleod points out that for diagnostic purposes the examination of fresh malarial blood films immediately after preparation is without doubt most to be relied upon. This is, however, not always convenient, and in a large practice it is often very inconvenient, so that one is driven to the examination of stained films at more convenient times. The staining of such films is an uncertain and troublesome process, so far as results that can be relied upon for diagnostic purposes are concerned. Macleod has succeeded in finding plasmodia in a preparation made by drawing across one cover glass the edge of another square cover charged with a drop of blood. He subsequently found that the same result could be effected by the use of a strip of ordinary note paper, instead of the cover glass, for the purpose of spreading the film. The straight edge

of a half-inch strip is drawn its full length through a drop of blood on the finger tip not larger than the head of a pin the finger tip and the cover glass being previousy cleansed thourghly in the usual way. If too much blood be taken on the strip the film will be too thick and useless. The edge of the strip is quickly drawn across the cover glass, the strip being held nearly at right angles to the surface of the glass and before the blood has had time to dry upon the paper. In this way is spread on the cover glass (or slide if preferred) a fine film of blood which dries very quickly, and in it many excellent fields will be found, with the corpuscles lying on the flat and practieally unaltered. The cover glass must not be fixed to the slide by any medium that will rub between the two, causing everything to disappear from view, but it must be mounted dry. It can be gummed to the slide by a strip of thin paper, with a window exposing the blood smear, when the latter can be examined with a dry or an immersion lens. With a good quarter-inch objective crescents and the larger pigmented parasites, and with an oil twelfth the smaller pigmented forms, can easily be seen. The specimens can be thus preserved and examined at any subsequent time, and even stained later. The film on a slide can be examined with a dry lens without the intervention of a cover glass; then stained, dried, and examined without a cover glass with or without balsam. If an oil-immersion lens is used, the film when dried and unstained should be on the cover glass, as the layer of air between the cover glass and the slide, if the film is on the latter, prevents the oil working at its best. The films should be carefully protected from dust before they are mounted. The color of the protoplasm of the parasite is not quite the same dried as undried, and of course no movement of parasite or of pigment is possible in the dried state. Even the unpigmented parasites have been detected in the dried form as rings or signets, and they have been stained. Blood films treated in the manner outlined are subject to less interference than when fixed by heat, alcohol, ether, or other means, or when treated with one or more staining solutions, washed, dried, etc.

PRACTICAL SUGGESTIONS.

By L. A. WILLSON,

CLEVELAND, OHIO.

Water Sediment.—Use no stain or reagent of any kind if it be desired to see the contents alive or in a natural condition. If the water appears clear to the unassisted eye, nothing will generally be seen with the glass unless it be stained or allowed to settle and the sediment examined. To examine water from hydrants tie a bag over the spigot and let it run until the bag swells up like a sausage. Then remove the bag, turn the water into a conical glass, wash the sediment adhearing to the sides of the bag into the glass and set it away to settle. Nearly always, little specks will be found on the surface that prove interesting and which should be first viewed with an inch objective. The settling at the bottom should be examined thus: Dip a hollow tube, while holding a finger over the top. When the bottom is reached, remove the finger and let the sediment run up the tube. Then again close the top with the finger and let the drop fall upon a glass slip. Then cover and examine, first with an inch, and after with a quarter inch or higher objective. A bag in which smoking tobacco is sold, when thoroughly washed before using, will be found to be one of the best bags that can be used for the purpose.

Focussing.—It is a very safe and proper procedure in using powers of a quarter inch and higher, to carefully bring the objective down to the cover and then focus upwards with the coarse adjustment and, when almost obtained, finish with the fine adjustment.

Mounting Insects.—Small and nearly transparent insects may be prepared for mounting in Canada Balsam by soaking for a short time in oil of cloves or turpentine. Larger and darker insects must be rendered transparent. They should be soaked for twelve hours in a weak solution of caustic potash. The soft portion should then be carefnlly brushed off with a camel's-hair pencil. This latter process should be accomplished by placing the slip,

with the insects, in a dish of water. Wash in the water until the caustic potash is entirely removed. Then place the object in 95 per cent alcohol for twenty-four hours. Then soak in turpentine. The longer the object remains in the latter medium the clearer and more transparent will it become. It is well to allow it to remain at least twenty-four hours. When ready to mount, remove the object from the turpentine, center it on a glass slip and, under a dissecting microscope, carefully spread out and arrange the parts. In spreading, there is generally danger of breaking off parts and distorting the specimen. Lastly, mount in balsam.

Substitute for Selenite Plate.—For use with a polarizer, a cheap substitute for a selenite plate may be made from a well-selected mica film mounted in Canada Balsam on a plain glass slip and covered with a thin glass.

SCIENCE-GOSSIP.

Complete Set of the Journal.—We are now in possession of a complete set of the American Monthly Microscopical Journal which we can sell at a fair price. We should naturally prefer to sell it to a Public Library where many people could have access to it. The first five volumes are bound in half leather. The balance are unbound. The 15 year index goes with the set.

Rock Sections.—H. Rosenbusch has published "Mieroscopic Physiography of Rocks" 3rd edition, and has prepared collections of thin sections for practical Microscopic petrographical study. These collections contain thin sections of all the more important types of rocks. To eaeh one is added a brief description. Thus one may learn to identify the constituents of rocks. Collections of 120 thin sections $38; with the Macroscopic specimens $63. Collec-lection of 180, $56; with specimens $98. Collections of 250 $81; with specimens $144. These have to be imported from Bonn, Germany.

THE MICROSCOPE

DECEMBER, 1897.

NUMBER 60 NEW SERIES

Spider-Lines.

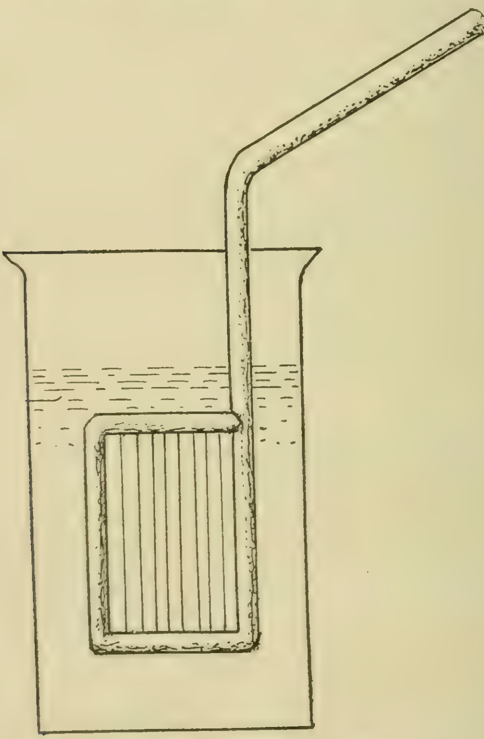
BY F. L. O. WADSWORTH,

YERKES OBSERVATORY.

It would be well to use for the cross-wires in our instruments something of a more reliable and permanent nature than the usual spider-web. This, although very fine and strong, has so many and such grave disadvantages as to make one wonder how it has ever been tolerated as long as it has. Formerly perhaps it might have been said that there was no thoroughly satisfactory substitute; even the finest metal wires prepared by the so-called Wollaston process being too coarse, and silk having the same disadvantages as spider-line itself in the way of hygroscopicity and semi-translucency. Now, however, the invention of the quartz fibre by Boys has provided us with something which is not only entirely unaffected by atmospheric changes, but also superior to spider-line, and, in fact, to all other known fibres, in strength and fineness. The quartz fibres themselves are transparent: but this difficulty is removed, and the fibers made more easily visible for handling and mounting as well, by silvering them by any of the well-known silvering processes. When properly silvered, they are perfectly opaque, even in the most strongly illuminated field.

I do not know who first proposed the use of silvered quartz fibres but their obvious advantages must have suggested their use for this and many similar purposes—

such as fine plumb and level lines, to many others besides myself. I first used them for the cross-wires of an observing telescope about five years ago, while a student at Clark University. I have continued to use them ever since, whenever it was possible to obtain or make them, and I know of many others whose experience has been



equally satisfactory. Nevertheless, they do not yet seem to be as generally known and widely used as they ought to be. It is sometimes difficult to obtain sufficiently fine fibres from dealers, at least in this country ; but anyone can, after a little practice, make them for himself, the only really essential things being a good oxyhydrogen blow pipe and a supply of reasonably pure hydrogen (coal gas is very unsatisfactory) and oxygen in pressure tanks.

These requisites can now all be readily obtained from any good dealer in projection apparatus. Many plans for "shooting" the fibres have been proposed; but I have never found anything more simple or satisfactory than the original bow-and-arrow method of Prof. Boys.

For silvering them I prefer Brashear's method. To get a good coat it is, however, necessary to clean the fibre very carefully. For this purpose I have found it best to use in succession very hot solutions of strong nitric acid and strong potash, and then wash in several changes of clean distilled water before immersing in the silver solution. In order to handle the fibres during these operations, I have found it convenient to mount them on a small rectangular glass frame with a bent handle, similar to that shown in the figure. The ends of the fibres are secured to the upper and lower bars of the frame by fused (not dissolved) shellac, which resists well the action of the hot acid and alkali. In lifting the frame in and out of the solutions, care should be taken to move it vertically up and down, otherwise the fine fibres will be broken by the surface tension of the liquid surface. On such a frame a dozen fibres may be silvered at once; and then set aside for use as desired.

Another great advantage which such silvered fibres would be likely to possess when used in bright wire micrometers—i. e., that of perfect and uniform illumination was pointed out by Prof. Burnham. To get the best results in such a case a cylindrical mirror should be placed behind the wire (on the side away from the source of illumination) with its axis parallel to the length of the wire.

The Achromatic Prism.

By ARTHUR M. EDWARDS, M. D.,

NEWARK, N. J.

When a beginner, I was not blessed with money to keep pace with my enthusiasm. I soon found that I did not see all that I desired to or that could be seen with more apparatus. Lenses as magnifiers were beyond my reach, so I determined to eek out those I had by contrivances for illumination. My stand had no means of swinging the mirror to one side and thereby making the illuminating beam impinge at an oblique angle upon the lower surface of the slide. I devised a means of converging the almost parallel rays of the sun from all sides upon the object and thus getting oblique light, or, in case of need, cutting it off from all but one portion of the field for the same purpose. To do this I purchased for a few cents, and used a simple plano-convex lens of short focus, and, to fix and center it in the middle of my rigid stage, I cemented it by its plane side, with Canada balsam (Gum thus is better, being of higher refraction) to the lower surface of an ordinary glass microscopic slide of the usual dimensions of three inches by one. On the upper surface of such a slide, the glass bearing the object rested. Long ago, Dr. John Charles Hall employed a hemispherical lens used plane side up and with a dark stop cutting off the central rays. My contrivance was much cheaper, could be made at home, and permitted the use of unilateral illuminating rays.

It was followed by an illuminator which was made by Robert B. Tolles. This is a hemispherical lens of less than a quarter inch focus mounted on a brass tube so that I can screw it into the part beneath a larger stand. Soon after, Dr. Royston Pigott made an illuminator of the same construction and found it worked very nicely. I added two lenses, one above the other to my first illu-

minator to get more light. Several diaphrams made of blackened cardboard, were added and the instrument seemed complete.

Prof. Abbe made an illuminator, which is the kind now made and sold with all microscopes here and abroad, but it is just the same as mine.

The illuminator, which I made later was an achromatic prism. Unfortunately it is rather expensive as mounted in German silver, but is perfectly satisfactory. A prism is usally made of crown glass about two inches in the exterior sides, right angled, to reflect the light onto the stage. On one side it is plain and this is the immerging side for the light from the sun or source of illumination. The light is reflected on the bottom and issues from the opposite side, when it would be non-achromatic, were it not caught by an anchromatic lens, which is cemented to the prisms in the usual manner with Canada balsam. I now would use gum thus for cementing the lens to the prism. The lens is plane on one side, that next to the prism, and convex on the outer side where the rays immerge and are rendered converging on to the stage. Upper or lower side it matters not, though the under side is most common. The focus of the lens is five inches, but longer is sometimes convenient. Shorter is not necessary. With such a prism the light can be used of a kerosene lamp and rendered bright enough to use with a 1-12. It can be worked around to the horizontal or to the same plane of the stage. The advantages of such a prism are that the flint lens is enclosed between two crown surfaces, one the prism and the other the outer lens of the achromatic lens. It is thus kept clear from blows and although softer than the crown glass quite safe from injury. The apperture of the opening is great enough to render the light clear and bright.

The other contrivance, which I have added to my microscopic outfit, is a mode of rendering the ray of light

actinic, that is to say mono-chromatic. I place between it and the source of light, kerosene or sunlight, and the condenser, a film of glass which is rendered actinic by having color washed on it and rendered fixed by means of varnish, which may be shellac, gold size, gelatin, gum thus or anything. But the varnish does not signify as the actinism is got by rendering it colored by blue,—one of the so called aniline blues of commerce that are sold now everywhere and are employed for dyeing. These blues go by various names but they are all the same. The film colored blue thus cuts off all the other rays that may be present in the source of light and renders it one color, darker or lighter as the case may be. The light is then converged by a common plano-convex lens of about six inches focus to the object and I find it is efficient and thoroughly actinic. There are ways for rendering the light achromatic and actinic. Or simpler still, the film of glass colored by blue varnish is done away with and a solution in water of aniline blue is used in a glass bottle with parallel sides. In this manner the iight can readily be rendered actinic and the solution can be stronger or less strong with blue as seems necessary.

Discontinued.—We regret to announce that the International Journal of Microscopy and Natural Science, 16 years old, discontinued in October. The Observer of Portland. Conn., has also ceased to be published after six years of struggle. We are informed that the Journal of the Royal Microscopical Society is in a bad way and liable to go under at any time. This perodical of ours will also fall into the line. The 18 year old American Monthly will go on for the present.

Physicians who use electricity should send to Wm. F. Howe, M. D., Indianapolis, for a sample of The Electro-Therapeutist a monthly devoted to the subject.

Obsidian.

By W. S. BEEKMAN,

WEST MEDFORD, MASS.

One of the amusing anecdotes given by the famous Stoddard, in his lectures, is somewhat like this: An old scout whose aim with the rifle was always of unerring certainty, being within the grand Yellowstone, came suddenly one day face to face with a monstrous bear. He fired and was surprised to find that the animal remained quietly about its own affairs. With great precision he tried again, but he found his aim was not producing results. Advancing towards his victim he found himself against a great glassy wall. It was through a mountain of obsidian he had been looking and his bear was still on the other side. This must have been when Obsidian was more crystalline clear than it now is.

To the student, this volcanic glass has often been the means of similar wasted efforts. It is simply a fused glass without detail. In some specimens, however, may be found the peculiar minute detail that brings it within the class of objects for slide study. When the development of crystallites has become so advanced that a partial devitrification ensues, as in the variety called Pitchstones, slides for polarized-light are possible. The writing of the present article is due to the fact that a quantity has been found which has formed the aggregation of its crystallites in fairly minute concretionary spherules. The flow-structure of this highly acidic lava is thus made on a small enough scale to be used as an opaque mount. The concretionary spherules, however, might bring out some very interesting features, if prepared. The writer has a lot of these interesting specimens, and would be pleased to send some to any one who sends a stamped addressed envelope.

THE MICROSCOPE.

New Series, 1893.

***For Naturalists**, Physicians, and Druggists, and Designed to Popularize Microscopy.*

Published monthly. Price $1.00 per annum. Subscriptions should end with the year. The old series, consisting of 12 volumes (1881–1892), ended with December, 1892. Sets of the old series cannot be furnished. All correspondence, exchanges, and books for notice should be addressed to the Microscopical Publishing Co., Washington, D. C., U. S. A.

CHARLES W. SMILEY, A. M., EDITOR.

EDITORIAL.

Publication Announcement.

The Journal will in 1898 be a 16-pp. illustrated magazine and confined very carefully to the subject of microscopy, omitting the "contributions to biology." No long articles can be accepted. Abstracts, news, and brief articles will be sought. Papers on the subject are scattered widely as is shown by our exchanges. A great number of short items and abstracts of articles will be possible. The price of subscription will be restored to one dollar.

The publication of "The Microscope" will be discontinued with this issue and its subscription list turned over to the American Monthly Microscopical Journal. That magazine will be supplied to all those who have been its subscribers. Those who have taken both periodicals will receive the Journal only unless they by post card or otherwise request a discontinuance. We shall treat all our exchanges in the same way.

Unappreciative.—It may be well to call attention of our friends to the neglect which the Am. Mic. Society has persisted in showing to Professor Seaman of Washington. For three years he acted as the secretary, spent a great

amount of time in an effort ill-advised to be sure to issue a quarterly magazine, and did about all that was done for the society those years. At the expiration of his term, the very proper thing to do was to promote him to the presidency and let him have that much coveted "F. R. M. S." to add on to his name. But that has not yet been done and this year the society rather than do the honor to him has given its presidency to a man who had previously held it. The management of this society is evidently thoughtless and fast killing off all public interest in its doings. Witness the presence of but about 10 people out of all its members this year.

Obituary.—Wm. Archer died, Aug. 14, 1897, in Dublin. He was once an editor of the Quarterly Journal of Microscopy and was Librarian of the Royal Dublin Society to date of decease. He was an authority on Desmids, Rhizpods and Infusoria.

Discolorrtion.—The discoloration of flowers and algae on drying is attributed to atmospheric ammonia. To counteract its injurious effect, Nienhaus has used pressing paper previously saturated with a one per cent. oxalic acid solution, and dried, obtaining in this way beautiful specimens of some of the most difficult flowers to preserve, unchanged.

PRACTICAL SUGGESTIONS.

By L. A. WILLSON,

CLEVELAND, OHIO.

Increase of Blood Corpuscles.—If after eating pure food, fresh outdoor air is breathed, the blood will show a large increase in red corpuscles, but by drinking stimulants, the red disks are decreased in serious proportions.

Sword-Moss.—Send stamped envelope to Mrs. Elizabeth G. Brinton, New Dorp, Staten Island, N. Y., and request a specimen of sword moss. Send 10 cents to the Plant World, Binghampton, N. Y., asking for the October

number in which is a description of the sword-moss, or better, send a dollar for a year's subscription to current volume.

SCIENCE-GOSSIP.

Eggs of Insects.—The collection, preservation and examination of the eggs of insects, will afford interesting recreation. Curtains, carpets, floor-crevices, cushions, furs and wollen garments will serve as a prolific hunting ground indoors; while out of doors the surface waters of ponds and water-butts, the corpses of birds, the skins of cattle, and the leaves and branches of the shrubberies give an abundance of material. Among those insects whose eggs make the most interesting microscopical mounts may be noted the common house-fly, the wasp, the tortoise-shell and the cabbage butterflies, the mottled umber and the puss moths, the dragon-fly, and most of the prarasites. The eggs of these are of all shades hexagonal, conical, oval, spherical, and are most richly and harmoniously colored; while the elaborately sculptured surfaces are hardly excelled in the beauty of their designs by the symmetry of the ciliated, winged and fringed ornamentations with which they are surrounded.—*Science-Gossip.*

Oysters.—The sudden disappearance of oysters from places where they were formerly numerous may be, in part, explained by a recent remarkable visitation in the harbor of Sydney, New South Wales. The water, in places, suddenly assumed the color of blood. This proved to be due to the invasion or rapid development of a microscopic *Glenodium*, which, in a few days, destroyed half of the animals near the land, and seriously injured the oyster-beds.

Color-Reaction.—Nylander was one of the first to call the attention of biologists to the value of color-reaction in the study of the lichens. The three principal re-agents used by microscopists are, (1) iodine to give blue reactions; hypochlorite of lime to give red reactions; (3) hydrate of (2)

potash to give yellow reactions. Iodine possesses the property of turning starch and amyloid bodies blue, and so is generally applied to sections of the apothecia, when the asci are transformed from their plain semi-transparency to a delicate blue, thus rendering them at once visible, and their forms and positions may be easily ascertained. The lime and potash tests are generally used on the thallus or leaf-like portion of the lichen, some-times on the surface only, and at others on the medullary layer.

Mounting Medium.—An adhesive material for labels on glass, or for fastening opaque objects for the microscope, is this; Take 120 grains of gum arabic and dissolve it in a quarter of a litre of water. Dissolve thirty grains of powdered gum tragacanth in a similar quantity of water. After a few hours, shake the latter solution until it froths, and mix with the former. Strain the mixture through linen, and afterwards add to it 150 grams of glycerine, previously mixed with 2½ grams of oil of thyme.

Glycerine.—Is one of the most useful of mounting mediums, but a difficulty is usually experienced with it when ringing. This may be overcome by using gum damar dissolved in benzoline instead of the usual gold-size.

CORRESPONDENCE.

Staining Vegetable Cells.—I am working now on the resting nucleus, and kanyokinetic figures, in vegetable cells of the onion, but am sort of groping in the dark, not knowing the length of time for fixing, staining, etc.

I am using Fleming's chrom-osmic-acetic acid solution for fixing, imbedding in paraffine, haematoxlin stain, but do not meet with first class results. Would like suggestions. —I. Percy Blackman, Sandy Hook, Conn.

Specimens.—From time to time I have sent little notices which you have very kindly used, I have sent away quite a number of specimens after each publication. This I am glad to do and for those little quarts crystals which seem to please, I have had repeated calls.—W. S. Beekman.

RECENT PUBLICATIONS.

Labrador and Anticosti.—By Rev. V. A. Huard, A. M., Chicoutimi, Quebec. Paper, 8 vo. pp. 505, map and illustrations. Price $1.70 post paid.

The author of this charming narrative is president of a seminary and editor of a scientific magazine at Chicoutimi in the province of Quebec. The book is in the French language and is especially recommended to those Americans who read or are studying that language and who can interest themselves in travel, history, topography, fishing, Indian remains and the wilds of our far north. The story is very interesting and the French pure. Perhaps no more charming account of frontier life will be found than this. Send postal order to the author for a copy.

Stirpiculture.—By M. L. Holbrook, M. D., New York, 1897. 12mo. pp, 192, cloth.

The title is bad but the book is good, and should be read by every one contemplating marriage as well as by every parent interested in the quality of his offsprings. Fewer and better children are wanted.

Send the price (one dollar or less) to Dr. Holbrook, New York City, before acting in any way that looks towards procreation.

Atlas and Essentials of Bacteriology.—By Prof. K. B. Lehmann and Dr. Rudolf Newman. Illustrated, New York, 1897.

The greater part of this new handbook is made up of some sixty-three plates printed in different colors, most of them containing several figures illustrating the growth and microscopical appearance of the various pathogenic bacteria. It includes microscopical examination, the most important solution for making prepations, the preparation of stained specimens, section preparations, culture of bacteria. This book is likely to be very useful to those practitioners of medicine who have received much elementary instruction in bacteriology.

THE MICROSCOPE INDEX.

LIST OF ILLUSTRATIONS.